

A remarkable species richness of the Barleeidae (Gastropoda: Rissoacea) in the Eastern Atlantic

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ABSTRACT

The family Barleeidae, hitherto known in the Eastern Atlantic from two European and Northwest African species of *Barleeia* and two species of *Tropidorissoia* from São Tomé, is found to be represented by 18 species, 14 of which (8 *Barleeia*, 3 *Pseudodiala*, 3 *Lirobarleeia*) are here described as new. Three new species share several shell or radular characters with the type species of *Pseudodiala* and not with *Barleeia*. For this reason *Pseudodiala* is considered to be a valid genus. There are four centers of diversity: Senegal (3 species), the Cape Verde Islands (3 species), São Tomé and Príncipe (6 species) and Southern Angola (6 species), together making the Eastern Atlantic the second most species-rich area after Western America, and the area with the highest diversity at the genus level.

Key words: Barleeidae, western Africa, new species, species diversity, biogeography

INTRODUCTION

The Barleeidae is a family of minute prosobranchs that typically live on intertidal or shallow subtidal hard bottoms of temperate to tropical areas. Many species live within coralline algae, or on "maerl", deposits of living calcareous algal concretions. The genera of the Barleeidae have been reviewed by Ponder (1983), who then considered the Anabathrinae as a subfamily of the Barleeidae but later raised them to full family status (Ponder, 1988).

Western America, from California to Panama and the Galapagos Islands, is the area with most described species of Barleeidae: 25 species are recognized as valid by Ponder (1983). The family is also represented in the Caribbean, eastern South America, East and South Africa, South east Asia, Australia and New Zealand, and Japan, but generally with low (1–5) species richness.

The family is known hitherto in the Eastern Atlantic by four species: the mainly European *Barleeia unifasciata* (Montagu, 1803), a less well known species *B. gougeoti* (Michaud, 1830) from NW Africa, and two species of *Tropidorissoia* from the Island of São Tomé, in the Gulf of Guinea (Tomlin & Shackleford, 1915; Rolán & Templado, 1994). Several species that may be assigned

to the Barleeidae were described from the island of St. Helena (Smith, 1890), but the systematic position of most of them remains uncertain until living animals are examined.

Recent collecting in Angola by the author, and other collectors' material from West Africa in Muséum National d'Histoire Naturelle of Paris and Museo Nacional de Ciencias Naturales, Madrid, has shown that there are a number of undescribed species of Barleeidae on the mainland coast of West Africa, the Cape Verde Islands, São Tomé and Príncipe, making this area one of the centers of species diversity for the family. No species assignable to the Anabathridae has been found in this material, with the exception of the southernmost records of the European species *Nodulus contortus* (Jeffreys, 1856) in Mauritania.

The material examined has the following origins:

—dredgings and shore collecting by I. Marche-Marchad, 1953–1956, mostly from Senegal (MNHN).

—intertidal collecting in the Canary Islands (1981) and Mauritania (1983) by P. Bouchet (MNHN).

—the author's collecting in Angola and São Tomé, 1981–1987, and in Europe (MNHN).

—intertidal and SCUBA collecting in the Cape Verde Islands by the "1a expedición Científica Iberica a Cabo Verde", August 1985 (MNCN).

—intertidal and shallow subtidal collecting by E. Rolán in São Tomé, Príncipe and the Cape Verde Is. (MNCN and private collection of E. Rolán, Vigo).

Radulae have been examined using SEM for a number of species. Radular morphology has been found informative for classification at the family and genus level, but not for the discrimination of closely related species.

ABBREVIATIONS

AMS	= Australian Museum, Sydney.
CER	= private collection of Emilio Rolán, Vigo.
MNHN	= Muséum National d'Histoire Naturelle, Paris.
MNCN	= Museo Nacional de Ciencias Naturales, Madrid.
UAN	= Universidade Agostinho Neto, Luanda.
cat.	= catalogue number.

leg. = "legit", collected by.
 spec., specs. = live-collected specimen(s).
 sh. = shell(s).
 juv. = juvenile(s).
 SEM = Scanning electron micrograph(s).
 * denotes specimens in the wet collection.

SYSTEMATICS

Family BARLEEIDAE Gray, 1857

The family is diagnosed by having: a pitted protoconch, a groove on the sole of the metapodium reaching its posterior end, and a single-layered operculum with an inner peg. This last character differentiates the Barleeidae from the Anabathridae. Pallial and metapodial tentacles are typically absent. The reader is referred to Ponder (1983) for a detailed account of the family.

Genus *Barleecia* Clark, 1855

Type species: *Turbo ruber* Adams, 1797 (= *Turbo unifasciatus* Montagu, 1803), non *Turbo ruber* von Salis, 1793, by monotypy.

Shell with smooth, solid teleoconch in all species considered, non-umbilicate or very narrowly umbilicate, generally with reddish tinge. Aperture ovate, slightly prosocline to orthocline, with smooth lip thickened at some distance inside, and then beveled to a thin edge. Head-foot typically pigmented with black and yellow. Operculum with an internal peg, a smooth nucleus on the columellar side, and fine growth lines on the remainder of the external surface; a conspicuous external ridge along the columellar side, overrunning the nucleus.

Radula (Ponder, 1983 and herein, Fig. 71–72): central tooth with a large rectangular median cusp and 2–3 small lateral denticles, one sharp basal denticle on each side, separated by a broad, hardly prominent lamella. Lateral teeth (one pair) with a rather broad base, terminating with a large, rather trapezoidal cusp flanked by 2–3 smaller cusps to the inner side and the outer side; with a U-shaped projection beneath those. Marginal teeth (two pairs) narrow, hook-shaped, with small, unipectinate cusps towards the distal end.

Barleecia unifasciata (Montagu, 1803)
 (Figures 1, 29–30)

Turbo ruber Adams, 1797: 66, pl. 13 fig. 21–22 (non *Turbo ruber* von Salis, 1793). Type locality: Pembrokeshire (British Isles).

Turbo unifasciatus Montagu, 1803: 327–328. Type locality: Southampton, and Island of Burrow, Devon (British Isles).

Rissoa fulva Michaud, 1830: 12 (repr. 1832: 15), pl. 1, fig. 17–18. Type locality: not specified, localities mentioned: Agde, Sète (Mediterranean France) and Corsica.

Sabanaea binghamiana Leach, 1852: 154. Type locality: Torbay, Devon (British Isles).

Barleecia rubra var. *elongata* Bucquoy, Dautzenberg & Dollfus, 1884: 316, pl. 32, fig. 23. *Barleecia elongata* "n.sp." Locard,

1886: 272 and 576. Type locality: Roussillon (Mediterranean France).

Material examined: (collected by the author unless otherwise stated; all in MNHN) **Europe:** Guernsey, Vazon Bay, at low tide among corallines, 1000+ specs., 9.1994; Guernsey, Rocquaine Bay, 1000+ specs., 9.1994. Ploumanac'h (Finistère), at low tide on *Corallina*, 300 specs. (many juv.); Lampaul-Ploudalmezeau (Finistère), on *Corallina*, 1000+ specs. (mostly juv.; adults 2.3 × 1.3 to 2.8 × 1.8 mm); Ile de Sein (Finistère), 300 specs.; Guéthary (Pyrénées-Atlantiques), 54* spec. (2.9 × 1.7 to 3.3 × 2.0 mm); St. Jean de Luz (Pyrénées Atlantiques), 30*+ 150 specs. (2.4 × 1.4 to 3.2 × 1.8 mm); Hendaye (Pyrénées-Atlantiques), 200 specs.; San Sebastián (Guipuzcoa), 1000+ specs.; Ondarroa (Guipuzcoa), 1000+ specs.; Calahonda (Málaga), 200 specs.; Los Escullos (Almería), 7 specs. **Strait of Gibraltar, Ceuta:** Benzú, low tide, 4 specs. **Morocco:** Punta Cires, intertidal in algae, 100 specs.; Tangier Bay, El Ghandouri, 20 specs.; Rabat, near Lahlou, 12 specs.; Mohammedia (=Fedala), 30 sh.; Near Tarfaya, 35 specs., Ortea leg. 8.1987 (2.5 × 1.5 to 2.7 × 1.7, pattern of foot checked on rehydrated specimen). **Mauritania:** Baie de l'Etoile, 250 specs. (1.8 × 1.2 to 2.5 × 1.5 mm), Bouchet leg. 1983; Cap Blanc, exposed rocky shore, 18 specs. (16 juv.), Bouchet leg. 1983; Pointe des Maures, 100+ specs., Bouchet leg. 1983. **Senegal:** Dakar area, 500 sh., Marche-Marchad leg.; Anse Bernard, 5 specs., Marche-Marchad leg. **Tenerife, Canary Islands:** Playa Santo Domingo, 75 specs. (50 juv.), Bouchet leg. 7.1981; Punta del Hidalgo, 200 specs. (30 juv.), Bouchet leg. 7.1981; La Tejita, intertidal, 34 sh. (10 juv.), Bouchet leg. 7.1981; Palm-Mar, intertidal, 25 specs., Bouchet leg. 1981.

Description: Shell conical, solid, adults 2.3 × 1.3 to 3.3 × 2.0 mm. Protoconch dome-shaped (450–500 μ in diameter) of 1½ to 1¾ whorls, with very minute spiral rows of pits. Teleoconch of 3¼ to 3½ whorls. Spire whorls rather flat, body whorl rounded and imperforate. Outer lip slightly prosocline, beveled inside to a thin edge. Color of shell reddish brown, paler towards the parietal insertion of the body whorl; plain or with whitish spiral bands, subsutural, median on body whorl and/or periumbilical; rarely entirely of a pale, wax-like color. Operculum dark crimson. Head-foot with superficial plain black pattern on upper part of head, snout, sides of foot and opercular lobes, upper part of propodium with black area extending on the edges, and grading to a broad axial white area; sole entirely colorless. Yellow axial bar on tentacles, large, triangular yellow granular masses behind each eye.

Habitat: On rocky shores, among red algae (preferably *Corallina*) at low water mark or in tidal pools (Southgate, 1982; Borja, 1986a, 1986b, 1987); in shallow photophilous algal mats in the Mediterranean.

Distribution: From the British Isles to Senegal, the Canary Is. and in the Mediterranean (including the Adriatic and the Eastern Mediterranean, but not the Black Sea).

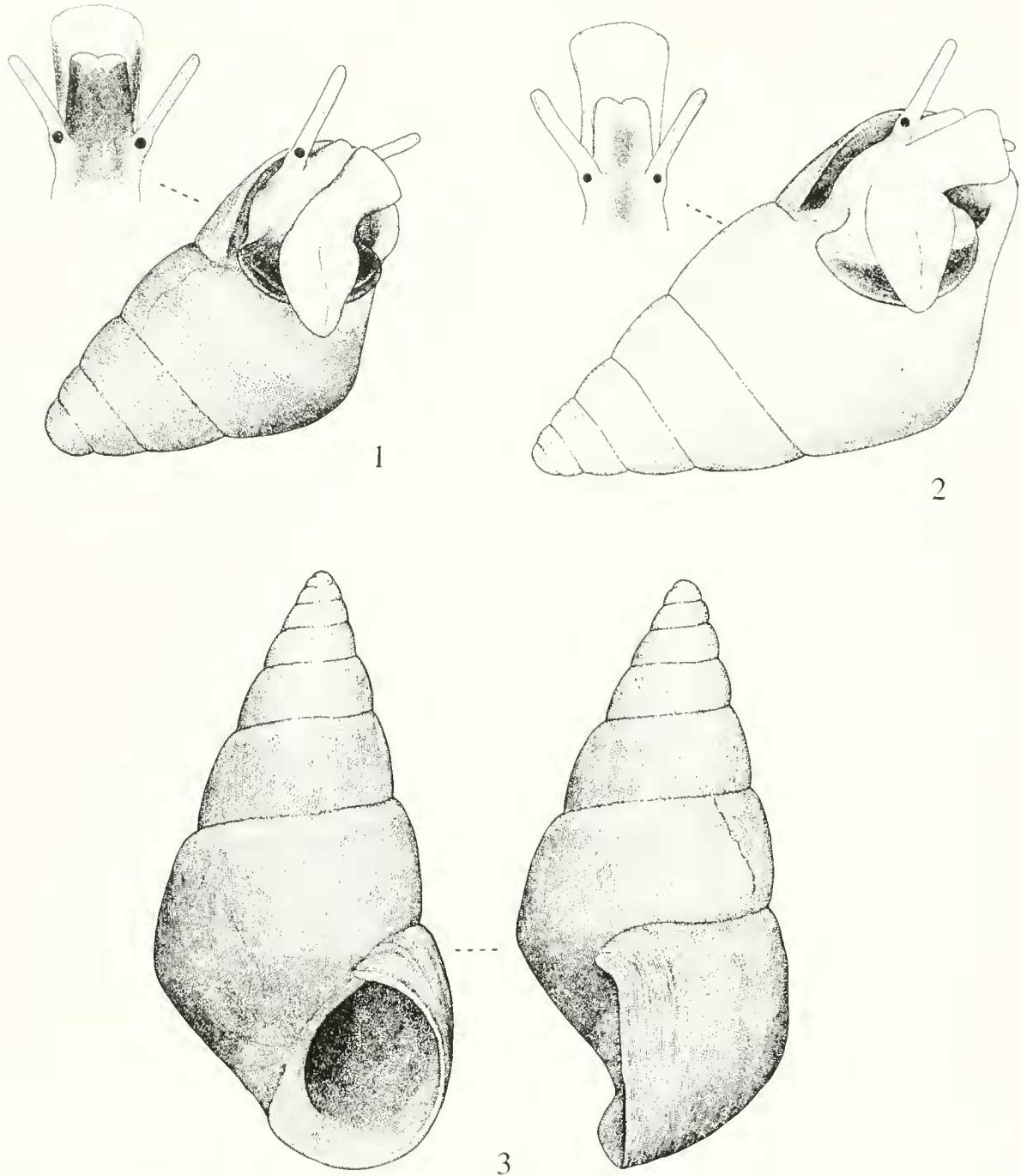


Figure 1. *Barleeia unifasciata* (Montagu, 1803), living animal from Ceuta. Length of shell 2.6 mm. Figure 2-3. *Barleeia gougeti* (Michaud, 1830). 2. Living animal from Ceuta. Length of shell 4.3 mm. 3. Specimen from Dakar, length 5.6 mm.

Remarks: The above description is based on specimens from Western Europe and Morocco; such typical *B. unifasciata* are found as far south as Tafaya, Morocco. The populations examined from Baie de l'Étoile, Mauritania and from Senegal are smaller, paler, with more variable profile, but are tentatively assigned to *B. unifasciata* pending further study.

Bellon-Humbert (1974) has figured *Barleeia unifasciata* from Morocco as "*Barleeia minuscula* Montero-

sato", and the sympatric *B. gougeti* as "*B. rubra*"; Monterosato's (1889) description and indication of size (1.5 mm) for *B. minuscula*, although laconic, fit *Coriandria fulgida* (Adams, 1797), a common species on the entire Atlantic coast of Morocco. I consider *Barleeia minuscula* a synonym of *Coriandria fulgida*, a view further supported by the fact that Monterosato lists both *B. rubra* and *B. gougeti* but no species referable to *Coriandria*.

Populations from the Canary Islands cannot be distin-

guished conchologically from those of Western Europe, and are thus treated as conspecific although it is likely that very little, if any, genetic exchange occurs. The head-foot of Canarian specimens is darker, and the entire propodium is black.

Barleeia gougeti (Michaud, 1830)
(Figures 2–3, 31–32)

Rissoa gougeti Michaud, 1830:9, pl.1, fig.7–8. Type locality: Senegal.

Hydrobia compacta Jeffreys, 1853:120, pl.9, fig.9 (non *Hydrobia compacta* Carpenter, 1864). Type locality: Tangiers (Morocco).

? *Barleeia majuscula* Monterosato, 1884:69. Type locality: not specified, localities mentioned: Ognina (Sicily), Alger (Algeria), Lampedusa (Sicily channel).

Barleeia gougeti var. *unicolor* Monterosato, 1889:34 (Casablanca, Morocco).

Barleeia gougeti var. *cerca* Monterosato, 1889:34 (Casablanca, Morocco).

Barleeia carrozzai van Aartsen & Giannuzzi-Savelli, 1991 (replacement name for *Hydrobia compacta*).

Material examined: (collected by the author unless otherwise stated; all in MNHN) **Spain:** Tarifa, intertidal, 3 specs. (3.5 × 2.1 mm). **Strait of Gibraltar, Ceuta:** Punta Almina 35–40 m, 38* + 12 specs. (4.3 × 2.3 to 5.5 × 2.8 mm), Bouchet leg. 5.1986; Benzú, 8 sh. (white). **Morocco:** Temara, low tide, 10 spec.; Mouth of Oued Yquem (= Rose-Marie), S. of Rabat, 31 spec., de Lepiney leg.; Mohammedia (= Fedala) 50 sh.; El Jadida (= Mazagan), low tide, 400 specs.; Essaouira (= Mogador), 300 specs. (2.7 × 1.6 to 6.1 × 3.0 mm); Near Tarfaya, 12 specs., Ortea leg. 8.1987. **Mauritania:** Baie de l'Etoile, 140 specs. (2.9 × 1.7 to 4.3 × 2.3 mm), Bouchet leg. 1983. **Senegal:** Dakar, 8 specs. (5.0 × 3.1 to 5.9 × 3.2 mm), Nicklès leg. 1946; Gorée, 7 sh. (pale periumbilical zone), H. Fischer collection; Gorée, baie de St. Jean, 50 specs., Delais leg. 1.1962; Gorée 20 m, 10 specs., Pin leg. 1994; Bel-Air near Dakar, 6–8 m, 59 specs. (3.1 × 1.8 to 5.0 × 2.7 mm, with attached *Crepidula*), Marche-Marchad leg.; Dakar, Anse Bernard, 9 specs., Marche-Marchad leg.; Dakar-ville, 10 specs., Pin leg. 1994.

Description: Shell conical, solid, adults 2.7 × 1.6 to 6.1 × 3.0 mm. Protoconch dome-shaped (500 μ in diameter), of 1½ to 1¾ whorls, with very minute spiral rows of pits. Teleoconch of 4 to 5 whorls. Spire whorls rather flat, profile of body whorl very faintly carinate and imperforate. Outer lip strongly prosocline near its parietal insertion, then nearly orthocline. Columella protruding anteriorly, more pronounced in juveniles, only slightly in adults where the aperture is more rounded. Color of shell reddish brown, paler towards the parietal insertion of the body whorl; plain or with periumbilical whitish spiral zone; sometimes entirely of a pale, wax-like color. Operculum dark crimson. Head-foot with superficial plain black pattern on upper part of head, snout, and opercular lobes; upper part of propodium and sole entirely colorless. Yellow axial bar on tentacles, large, yellow granular

masses behind each eye and (most often) in each opercular lobe anteriorly to the black markings.

Habitat: On hard bottoms with algal concretions, low intertidal to 40 m.

Distribution: From the Strait of Gibraltar to Senegal.

Remarks: This large species occurs sympatrically with *B. unifasciata* all along the coast of NW Africa, from the Strait of Gibraltar southwards. *Barleeia gougeti* is usually subtidal and is restricted to the lowermost part of the tidal zone, whereas *B. unifasciata* is essentially an intertidal species. The relative abundance of both species is variable, with *B. gougeti* the most abundant species south of Rabat in Morocco.

The ranges of sizes in the two species overlap, and the boundary cannot be clearly placed with only conchological characters. The most obvious distinctive character is the pigmentation pattern of the propodium, which has lateral black areas in *B. unifasciata* (a non-variable feature in Brittany and the Basque country where *B. unifasciata* occurs alone), and is white in *B. gougeti*. The columella of *B. gougeti* is more protruding than in *B. rubra*. Populations where an entirely pale shell is the dominant pattern are common in *B. gougeti*.

Barleeia verdensis Gofas, new species
(Figures 4, 33–34)

Type material: Holotype and 120 paratypes (MNCN cat. 15.05/20526); 120 paratypes (MNHN) collected alive from the type locality.

Type locality: Salmanza, São Vicente, Cape Verde Islands, (16°54'N, 24°57'W).

Material examined: (collected by E. Rolán except specimens with date 8.1985 collected by "1a expedición ibérica", or where otherwise stated) **Cape Verde Islands, Boavista:** Derrubado, 13 juv. sh. (CER); Rife de Chaves 4 m, 4 sh. + 25* specs. 5.1988 (CER); Baia Teodora 2 m, 32 + 12* specs. 4.1988 (CER); Morro da Areia, 5.1986 (MNCN); Sal Rei, 40 sh., 5.1986 (MNCN) and 38 sh. (CER). **Brava:** Furna, 8 sh. (CER). **Sal:** Mordeira, 3 specs., 5.1986 (MNCN) and 20 sh. (CER); Fontona, 125 specs. (mostly juv.), 8. 1985 (MNCN); Curral do Dado, 14 specs. (10 juv.) (MNCN); Joaquin Petinha, 157 specs., 8.1985 (MNCN); Parda, 1 spec. (MNCN); Palhona, 40 sh. + 4* specs., 5.1987 (CER); Sal (without further precision), 44 sh. (CER); Serra Negra, 4* specs., 5.1987 (CER); Calheta Fonda 2–5 m, 15* specs., 5.1988 (CER); Palmeira, 2 + 65* specs., 8.1985 (CER); Rigona, 7 specs., 8.1985 (MNCN). **São Nicolau:** Tarrafal, 3 sh., 8.1985 (MNCN). **Santiago:** Tarrafal, 38 sh. (CER). **São Vicente:** Salmanza, intertidal, 10 specs., Cosel leg. 12.1978 (MNHN); the type material (2.7 × 1.6 to 3.3 × 1.8 mm) and 100+ specs., 8.1985 (MNCN); 12 specs., 5.1987 (CER); Calhau, 4 sh. (CER).

Description: Shell conical with rather tall spire, very solid, adults 2.7 × 1.6 to 3.3 × 1.8 mm (holotype 3.2 ×

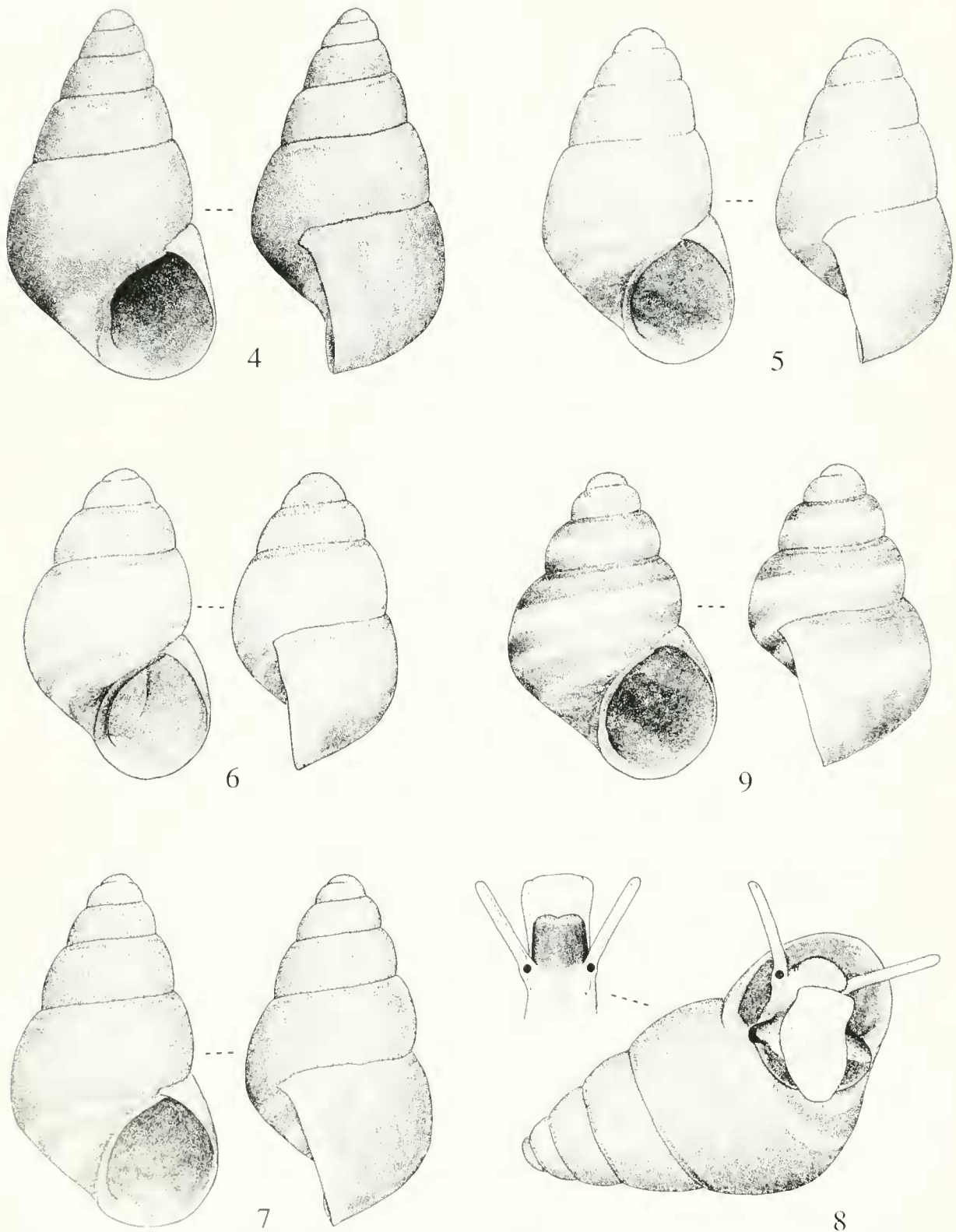


Figure 4. *Barlecia verdensis* Gofas, new species, holotype from Salmanza (São Vicente, Cape Verde Is.), length 3.2 mm. **Figure 5.** *Barlecia acmili* Gofas, new species, holotype from Saragasa (São Vicente, Cape Verde Is.), length 1.7 mm. **Figure 6.** *Barlecia chefae* Gofas, new species, holotype from Rife de Chaves (Sal, Cape Verde Is.), length 1.3 mm. **Figures 7–8.** *Barlecia tomensis* Gofas, new species. **7.** Holotype from Praia das Conchas (São Tomé), length 2.1 mm. **8.** Living specimen from Praia das Conchas (São Tomé), length 2.4 mm. **Figure 9.** *Barlecia taeniolata* Gofas, new species, holotype from Santa Ana (São Tomé), length 1.6 mm.

1.8 mm). Protoconch dome-shaped (350–400 μ in diameter), of $1\frac{1}{4}$ whorls, with very minute pits arranged in crowded spiral rows. Teleoconch with 4 whorls. Spire whorls rather flat, body whorl rounded, imperforate. Outer lip slightly prosocline, beveled both outside and inside to a thin edge; parietal callus narrow. Color of shell dark reddish brown, rather uniform except for a paler area towards the parietal insertion of the body whorl and a poorly defined paler band around the columellar area. Head-foot black except for the sole, the sides of the snout, and the tentacles. Yellow axial bars formed by crowded granules on tentacles; yellow granular masses on opercular lobes.

Habitat: Intertidal or shallow subtidal, among algae.

Distribution: Cape Verde Islands.

Remarks: This species resembles *B. unifasciata* and has been identified as "*B. rubra*" in the literature (e.g. Cosel, 1982 and references therein). It is distinguished by its smaller protoconch, with more crowded rows of pits, taller spire, and peculiar profile of the body whorl, due to the fact that the aperture is beveled not only inside as in other *Barleeia*, but also outside. It is distinguished from *B. gougeti* by its smaller size and less protruding columella.

Barleeia aemilii Gofas, new species
(Figures 5, 35–36)

Type material: Holotype and 40 paratypes (MNCN cat. 15.05/20527); 40 paratypes (MNHN) collected alive from the type locality.

Type locality: Saragasa, São Vicente, Cape Verde Islands (16°49'N, 24°52'W).

Material examined: (collected by E. Rolán, except specimens with date 8.1985 collected by "la expedición ibérica") **Cape Verde Islands, Boavista:** Sal Rei, 2 sh. (MNCN); Rife de Chaves, 4 m, 1 sh., 5. 1988 (CER). **Santa Luzia:** Praia Francisa, 3 sh. (CER). **Sal:** (without precision) 3 sh. (CER); Joaquin Petinha, intertidal, 9 specs., 8.1985 (MNCN) and 1 spec. (CER); Mordeira, 1 sh., 8.1985 (CER); Serra Negra, 1* spec., 5.1987 (CER); Palhona, 4 sh. (CER); Palmeira, on wharf, 8.1985, 2 specs. (MNCN) + 1* spec. (CER); Rigona, 1 spec., 8.1985 (MNCN); Rabo de Junco, 20 sh., (CER). **Santiago:** S of Tarrafal, 7 specs. + 16 sh. (CER); Prainha, Praia, 6 specs. (CER). **São Vicente:** Calhan, 11 sh. (CER); Saragasa, the type material, 8.1985 (1.4 \times 0.85 to 1.75 \times 1.0 mm); Salmanza, intertidal, 8.1985, 1 spec. (MNCN) + 30 specs., 5.1987 (CER) + 4* specs. (CER); Mindelo, Baía Matiota, 1 spec., Cosel leg. 12.1978 (MNHN).

Description: Shell conical, solid, adults 1.4 \times 0.85 to 1.8 \times 1.0 mm (holotype 1.7 \times 0.95 mm). Protoconch dome-shaped with flattened top (280–300 μ in diameter), $1\frac{1}{4}$ whorls, with very minute spiral rows of pits. Teleoconch of 3 to $3\frac{1}{4}$ whorls. Spire whorls rather flat, body whorl

very slightly angulated. Outer lip slightly prosocline, beveled inside to a thin edge; parietal callus narrow, detached over a tiny umbilical chink. Color of shell pale orange brown, paler towards the parietal insertion of the body whorl; with a sharply defined paler band along the angle of the body whorl, and a less clear pale band around the umbilical chink. Parietal callus tinged with brown. Shell of some individuals entirely of a pale, orange-brown color. Periostracum dull. Operculum reddish brown, more intense along the ridge and edges. Head-foot pale, with yellow axial bars on tentacles; greenish, iridescent buccal mass visible in the head by transparency.

Habitat: Intertidal or shallow subtidal, among algae.

Distribution: Cape Verde Islands.

Remarks: This species is readily distinguished from the previous one by its smaller size, banded color pattern and more pupoid profile. It is most closely related to *B. chefiae* n.sp., which is still smaller, has a more rounded periphery of the body whorl, and has a glossy periostracum rather than the dull, opaque texture found in *B. aemilii*. This species is dedicated to Dr. Emilio Rolán, of Vigo (Spain), a distinguished amateur who has been involved in most of the recent collecting in the Cape Verde Islands.

Barleeia chefiae Gofas, new species
(Figures 6, 37–38)

Type material: Holotype (live collected) and 2 paratypes (sh.) from the type locality (MNCN cat. 15.05/20528), 12 paratypes (sh.) from Porto Ferreiro (MNCN cat. 15.05/20529), 24 paratypes (sh.) from Sal Rei (12 MNCN cat. 15.05/20530, 12 MNHN).

Type locality: Rife de Chaves, Boavista, Cape Verde Islands, in 4 m.

Material examined: (collected by E. Rolán except specimens with date 8.1985 collected by "la expedición ibérica") **Cape Verde Islands, Boavista:** Derrubado, 2 sh. (CER); Baía Teodora, 1 sh. (CER); Porto Ferreiro, 4 m, 12 sh. (paratypes); Rife de Chaves, 4 m, the holotype, 2 paratypes (sh.) and 6 sh., 5.1988; Sal Rei, 24 sh. (paratypes), 8.1985. **Brava:** (no further details), 39 sh. (CER); Furna, 8 specs. (CER). **Santa Luzia:** Praia Francisa 1 m, 4 sh. (CER). **Santiago:** Tarrafal, 2 sh. (CER). **Sal:** Palhona, 1* spec. (CER). **São Vicente:** Saragasa, 2 specs., 8.1985 (MNCN); Pedrinha 2 sh. (CER).

Description: Shell pupoid, moderately solid, translucent, adults 1.1 \times 0.7 to 1.3 \times 0.75 mm (holotype 1.3 \times 0.75 mm). Protoconch dome-shaped with flattened top (260–270 μ in diameter), $1\frac{1}{4}$ whorls, with very minute spiral rows of pits. Teleoconch of 3 to $3\frac{1}{4}$ whorls. Spire whorls rather flat, body whorl rounded. Outer lip very slightly prosocline, beveled inside to a thin edge; parietal callus narrow, detached over a tiny umbilical chink. Color of shell brownish, with two sharply defined paler bands along the periphery of the body whorl, and around the

umbilical chink, and a broad, ill-defined pale area running along the whorls almost from suture to suture; a dark subsutural line ("false suture") corresponds to the inner surface of the whorl seen by transparency. Parietal callus and periumbilical area dark. Operculum colorless, translucent. Animal not observed.

Habitat: Shallow subtidal, among algae.

Distribution: Cape Verde Islands.

Remarks: This species is closely allied to the previous one, but has a distinctive, *Coriandria*-like appearance with its small size, glossy, pupoid shell and distinct banding pattern. It is also distinguished from all other species treated here by the colorless, translucent operculum. The correct placement in *Barleeia* is ascertained by the characters of the protoconch, operculum and radula.

This species is dedicated to Maria Josefa "Chefi" Alvarez Aza, Dr. Rolán's wife and a companion of the Cape Verde expeditions.

Barleeia tomensis Gofas, new species
(Figures 7–8, 39–40)

Type material: Holotype (MNHN) and 24 paratypes (12 MNHN, 12 MNCN cat. 15.05/20531) collected alive from the type locality.

Type locality: Praia das Conchas, São Tomé (00°24.7'N, 06°38.0'E), at low tide.

Material examined: **São Tomé:** Esprainha, 50* + 58 specs., Gofas and Fernandes leg. 11.1985 (MNHN); Praia das Conchas, the type material, Gofas and Fernandes leg. 11.1985; Praia das Conchas, 13 sh., Rolán leg. (CER); Mutamba, 28 specs., Fernandes leg. 12.1986 (MNHN); Mutamba, 53 sh., Rolán leg. (CER); Lagoa Azul, 5 sh., Rolán leg. (CER); Praia Morro Peixe, 2 specs., Gofas leg. 11.1983 (MNHN); Santa Ana, 2 m, 11 specs., Rolán leg. (CER).

Description: Shell conical, solid, adults 1.8 × 1.1 to 2.4 × 1.3 mm (holotype 2.1 × 1.2 mm). Protoconch high dome-shaped (350 μ in diameter) of 1½ to 1¾ whorls, with very minute spiral rows of pits. Teleoconch with 3¼ to 3½ whorls. Spire whorls moderately convex, body whorl rounded and imperforate. Outer lip slightly prosocline, beveled inside to a thin edge; parietal callus rather thin. Color of shell reddish brown, paler towards the parietal insertion of the body whorl; typically with two periumbilical spiral bands on body whorl. Operculum dark crimson. Head-foot with superficial black pattern covering the snout, fading behind the head; on opercular lobes and anteriorly on the sides of the epipodial folds; whitish yellow axial bar on tentacles, whitish/yellow granular masses behind each eye, on the tip of the snout, on the sole of the foot and the propodium, and on the opercular lobes anteriorly to the black markings.

Habitat: Intertidal to shallow subtidal on rocky shores with clear water; in algal growth of coralline and encrusting red algae.

Distribution: Only known from the Islands of São Tomé and Príncipe.

Remarks: This species was cited by Tomlin and Shackelford (1914) and Fernandes and Rolán (1993) as *Barleeia rubra*. The spotted sole of the foot distinguishes it from *B. gougeti* and *B. unifasciata*, which always have a colorless sole. The high spire recalls that of *B. verdensis* n. sp., but *B. tomensis* has a constant, characteristic double pale band around the umbilicus, and does not have the aperture beveled outside.

Barleeia taeniolata Gofas, new species
(Figures 9, 41–42)

Type material: Holotype and 5 paratypes (MNCN cat. 15.05/20532), empty shells from the type locality. 5 paratypes (sh.) from Lagoa Azul (MNHN).

Type locality: Santa Ana, São Tomé (00°15.5'N, 06°45'W), 2 m.

Material examined: **São Tomé:** Santa Ana, 2 m, 6 sh., Rolán leg. (holotype and paratypes MNCN); Baía de Ana Chaves, 2 m, 5 sh., Rolán leg. (CER); Praia das Conchas, 5 m, 1 sh., Rolán leg. (MNHN); Praia das Conchas, 2 sh., Gofas leg. (MNHN); Lagoa Azul, 4 m, 14 sh., Rolán leg. (paratypes MNHN; CER); Mutamba, 4 m, 21 sh., Rolán leg. (CER). **Príncipe:** Santo Antonio, 6–10 m, 1 sh., Rolán leg. (CER).

Description: Shell conical, rather translucent, holotype 1.6 × 1.05 mm. Protoconch high dome-shaped (300 μ in diameter) of 1¼ whorls, with very minute spiral rows of pits. Teleoconch with 3 whorls. Spire whorls convex, body whorl rounded and imperforate. Outer lip slightly prosocline, thin; parietal callus rather thin. Color of shell of a pale horny color, with two brown bands on the spire whorls and two more on the body whorl, one continuing the suture and one periumbilical; the two central bands on the body whorl commonly fused to form one broad band. Operculum and animal unknown.

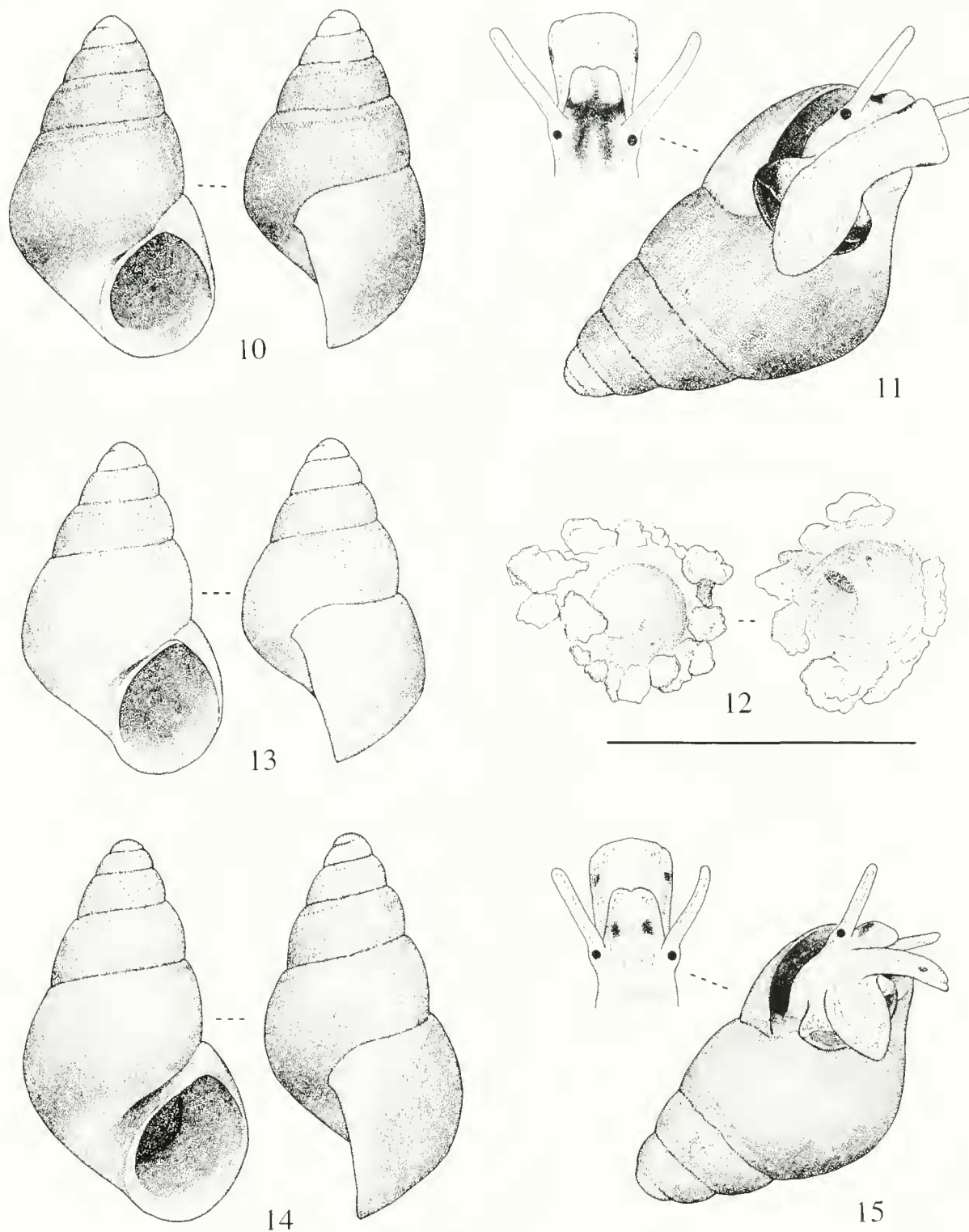
Habitat: Unknown, presumably sublittoral in shallow water.

Distribution: Only known from the Islands of São Tomé and Príncipe.

Remarks: The pitted protoconch of this species is characteristic of *Barleeia* although the shell resembles a *Coriandria* at first glance. It is easily separated from juvenile *B. tomensis* by the shorter spire, more convex whorls, and different color pattern. *Barleeia taeniolata* always has a pale area separating the suprasutural and subsutural brown bands on the whorls, whereas *B. tomensis* only has periumbilical pale bands.

Barleeia pervulgata Gofas, new species
(Figures 10–15, 47–52, 71–72)

Type material: Holotype (MNHN) and over 2000 paratypes (500, of which 100 are juveniles, in each of the



Figures 10–12. *Barlecia pervulgata* Gofas, new species. **10.** Holotype from Chapeu Armado (Angola), length 2.2 mm. **11.** Living animal from Chapeu Armado (Angola), length of shell 2.7 mm. **12.** Egg capsule containing a larva ready to hatch, from Chapeu Armado (Angola). Scale bar 1 mm. **Figures 13–15.** *Barlecia cf. pervulgata* Gofas, new species. **13.** Specimen of a "pale" morph from Santa Maria (Angola), length 2.1 mm. **14.** Specimen of a subtidal morph from Santa Maria (Angola), length 2.4 mm. **15.** Living animal of a subtidal morph from Porto Alexandre (Angola), length of shell 1.7 mm.

following: AMS cat. C.305091, MNCN cat. 15.05/20533, MNHN, UAN) collected alive from the type locality.

Type locality: Chapeu Armado, province of Namibe, Angola (14°27'S, 12°21'E), intertidal.

Material examined: (collected by the author; all MNHN except paratypes specified above) **Angola:** (*typical form*) Caotinha, 2800+ specs. (1.8 × 1.1 to 2.4 × 1.4 mm); Limagens, 800 specs., 12.1981 (1.7 × 1.0 to 2.2 × 1.3 mm); Santa Maria, intertidal, 1000 specs., 12.1981 (1.8 × 1.1 to 2.2 × 1.3 mm, many pale specs.); Santa Maria, dredged 8–10 m, 200 sh.; Lucira (Bissonga), 37 specs. (1.7 × 1.0 to 2.1 × 1.3 mm); Baía das Pipas, 300* specs., 2.1983 (2.4 × 1.5 to 2.9 × 1.7 mm); São Nicolau, 22* + 100* specs., 2.1983 (2.1 × 1.3 to 2.9 × 1.7 mm); Chapeu Armado, the type material (1.9 × 1.2 to 2.7 × 1.6 mm); Praia das Conchas, 200 specs. (2.2 × 1.4, to 2.8 × 1.7 mm); Praia Amelia, 400 + 18* specs., 2.1983 (1.6 × 1.0 to 2.5 × 1.4 mm, some white specs.). (*pale, banded form*) Caotinha, 2 specs. + 8 sh.; Limagens, 130 specs., 12.1981 (1.6 × 1.1 to 2.3 × 1.4 mm); Santa Maria, 0–2 m, 1 sh.; Sta Maria, 8–10 m, 12.1981 on calcareous algae: 50 specs. + 8 sh. (2.4 × 1.4 to 1.8 × 1.2 mm); Lucira (Bissonga), 2 specs.; São Nicolau, 7* + 25 specs. (2.1 × 1.2 to 2.2 × 1.3 mm); Chapeu Armado, 9 specs. + 24 sh. (2.0 × 1.3 to 2.7 × 1.6 mm); Praia Amelia, 19 specs. + 1 sh.; Baía dos Tigres, in mussel bed, 12* + 3000 specs., 8.1985. (*more delicate form from deeper water*): Santa Maria, 8–10 m, 12.1981 on calcareous algae, 600 specs.; Baía da Lucira (Cesar), 10 m, 10 sh.; Santa Marta, 40 m in shell sand, 100 sh.; Praia Amelia, 40–60 m, 25 sh.; off Porto Alexandre, 5* + 2 specs. (1.7 × 1.1 to 2.2 × 1.3 mm).

Description: Shell conical, very solid, adults 1.7 × 1.0 to 2.9 × 1.7 mm (holotype 2.2 × 1.3 mm). Protoconch dome-shaped (350 μ in diameter) of 1½ to 1¾ whorls, with very minute spiral rows of pits, sometimes also with ill-defined spiral sculpture. Teleoconch with 3¼ to 3½ whorls. Spire whorls rather flat, body whorl rounded and hardly umbilicate. Outer lip slightly prosocline, beveled inside to a thin edge; parietal callus thickened in adults, tending to form a ridge. Color of shell reddish brown, paler towards the parietal insertion of the body whorl; plain or with whitish spiral bands, subsutural, median on body whorl and/or periumbilical; rarely entirely of a pale, wax-like color. Operculum dark crimson. Head-foot with superficial black pattern on upper part of head generally forming a V-shaped pattern pointing forwards, then extending over the snout to the sides and axially; two small black spots on the sides of the propodium, sometimes also a pair of larger, blurred, black to grayish spots on the axial part of the propodium; opercular lobes black. Yellow axial bar on tentacles; yellow granular masses behind each eye, on each lobe of the tip of the snout and on opercular lobes anteriorly to the black areas; sole of foot circled by a line of yellow granules.

Habitat: Intertidal to shallow subtidal on rocky shores with clear water; in algal mats, mainly of coralline algae.

Distribution: Known only from the provinces of Benguela and Namibe, Southern Angola.

Remarks: This is by far the commonest *Barleeia* of Southern Angola. It somewhat resembles the European species *B. unifasciata* but is readily diagnosed by the yellow patterns on the foot, absent in the former.

The egg capsule (Fig. 12) has been observed in Chapeu Armado, and is very similar to that of *B. unifasciata* (Lebour, 1934; Southgate, 1982). It is spherical, contains a single developing larva, and is attached to the algal mat and embedded sand grains.

The above description (and Figs 10–11) is based on the populations commonly found in the intertidal zone from Caotinha to Praia Amelia. Besides this, there are two forms which may be distinguished morphologically and are sympatric in most localities:

(1) One form has a paler, commonly banded shell, with slightly more convex whorls and more distinct umbilical chink (Fig. 13). Such specimens also commonly have a taller protoconch, with more conspicuous spiral pattern. They are found on the shore at slightly lower levels than typical *B. pervulgata*, which is restricted to the shore. These forms look quite different at first glance, but many individuals cannot be convincingly separated within microsympatric populations; the sample from Limagens (intertidal) contains many banded forms of ambiguous morphology (e.g. with banded pattern but not with convex whorls). Also, the color pattern of the animal, usually a useful character at species level, varies within the same limits in both forms.

(2) A second form with a more delicate, taller, plain brown shell, occurring always subtidally on soft bottoms with calcareous algal concretions (Figs 14–15). This form never occurs microsympatrically with typical *B. pervulgata*, but is found in Santa Maria together with the above "paler" form in 5–10 m, where both forms cannot be convincingly separated. The color pattern of the animal is not very different from that of palest intertidal morphs.

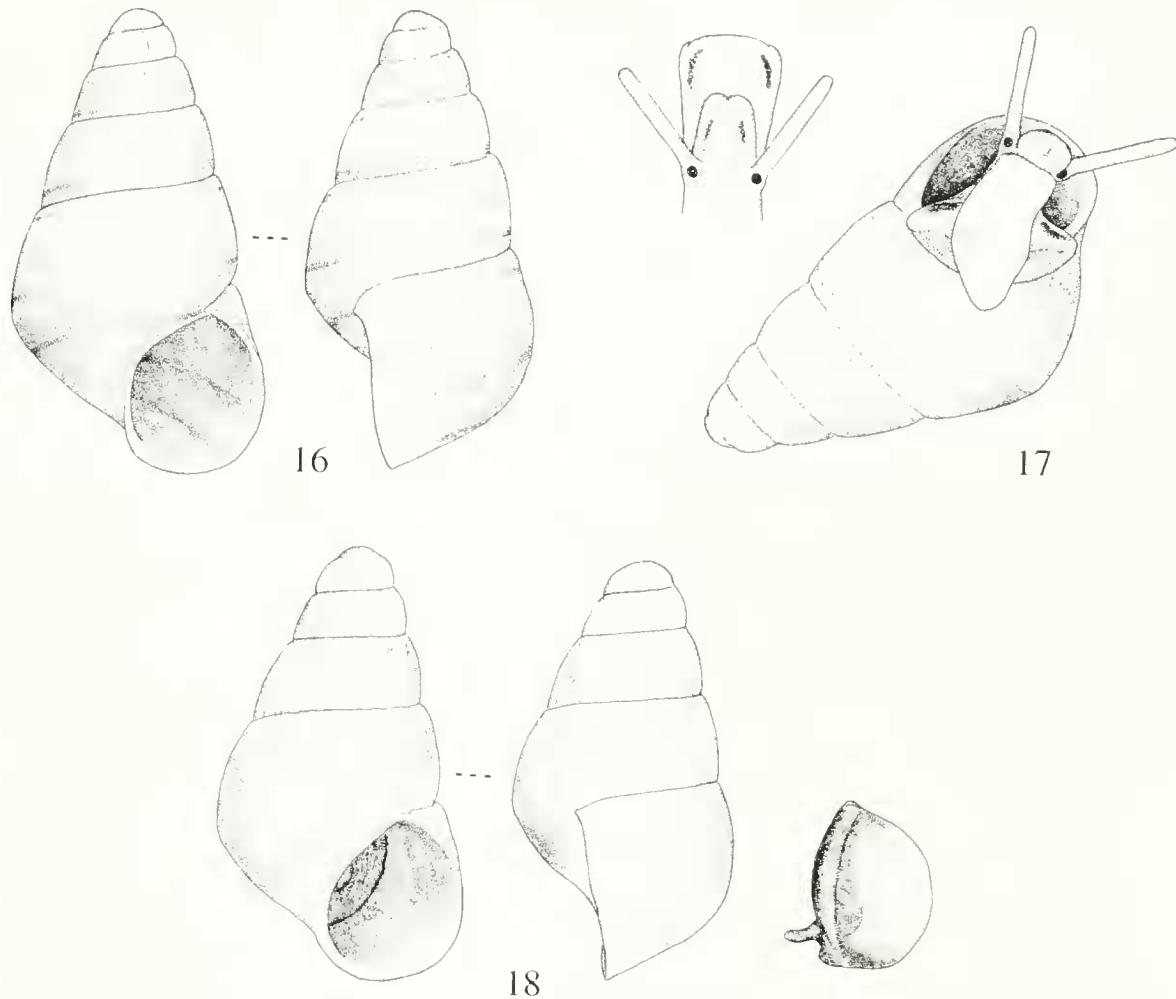
More study (e.g. using allozyme electrophoresis) may be necessary to determine whether the differences are merely ecophenotypic variation, or if there are more than one species with overlapping variation and/or limited introgression.

Barleeia cinguloides Gofas, new species
(Figures 16–17, 43–44)

Type material: Holotype (MNHN) and 64 paratypes (16 of which 4 juv., in each of the following: AMS cat. C.305092, MNCN cat. 15.05/20534, MNHN, UAN) collected alive from the type locality.

Type locality: Praia Amelia, province of Namibe, Angola (15°13'S, 12°07'E), intertidal.

Material examined: (collected by the author; all MNHN except paratypes specified above) **Angola:** Baía de Santa Maria 8–10 m, 5 sh.; Santa Marta, 40 m, 2 sh.; Baía das Pipas, 53* specs., 2.1983 (2.2 × 1.2 to 2.4 × 1.4 mm);



Figures 16–17. *Barleecia cinguloides* Gofas, new species. **16.** Holotype from Praia Amelia (Angola), length 2.4 mm. **17.** Living specimen from Praia Amelia (Angola), length of shell 2.4 mm. **Figure 18.** *Barleecia picta* Gofas, new species, holotype from Santa Maria (Angola), and operculum seen from outer side; length of shell 1.8 mm

Praia Amelia, intertidal, the type material (adults 2.2×1.3 to 2.5×1.4 mm) and 50 specs. (juv.).

Description: Shell high conical, quite solid, translucent, adults 2.2×1.2 to 2.5×1.4 mm (holotype 2.4×1.3 mm). Protoconch high dome-shaped (350μ in diameter) of $1\frac{1}{2}$ to $1\frac{3}{4}$ whorls, with spiral rows of relatively coarse pits, some of them irregularly fused along one row. Teleoconch with $3\frac{1}{4}$ to $3\frac{1}{2}$ whorls. Spire whorls rather flat, body whorl with a faint but sharp keel continuing the suture, imperforate. Outer lip nearly orthocline except for the parietal insertion where it is prosocline, beveled inside to a thin edge; parietal callus moderately thickened. Color of teleoconch pale buff, with narrow brown lines, one subsutural, one suprasutural on the spire and running just above the keel on body whorl, and one periumbilical. Operculum pale brown, external surface shagreened with hardly visible growth lines. Head-foot with superficial black pattern forming two patches anteriorly on each side of propodium, two longitudinal

streaks on the snout and patches on opercular lobes. A solid yellow bar on tentacles, yellow granular masses behind eyes, small yellow spots on each lobe of the snout, and on the sides of propodium; sole colorless.

Habitat: Intertidal on rocky platforms, among rocks covered with coralline algae and lying on coarse, clean sand.

Distribution: Known only from the provinces of Benguela and Namibe, Southern Angola.

Remarks: This species recalls the European rissoid *Cingula cingillus* (Montagu, 1803) in shape, color pattern, and even the intertidal habitat in sand under stones. It is readily distinguished from other Barleecidae by its color pattern; banded forms of *B. pervulgata* never have such narrow lines and lack the peripheral keel. The most closely related species is *B. picta* n. sp., similar in shell shape and in having coarse punctures on the protoconch, but colored with flames instead of spiral lines.

Barleeia picta Gofas, new species
(Figures 18, 45–46)

Type material: Holotype (MNHN) and 37 paratypes (9 AMS cat. C.305093, 9 MNCN cat. 15.05/20535, 10 MNHN, 9 UAN) collected alive from the type locality.

Type locality: Baía de Santa Maria, province of Benguela, Angola (13°35'S, 12°33'E), on calcareous algal bottom in 8–10 m.

Material examined: (collected by the author; all MNHN except paratypes specified above) **Angola:** off Ambrizete, 45 m, 7 sh. (2.2 × 1.4 to 2.6 × 1.6 mm, subfossil?); off Ilha de Luanda, 120 m: 1 sh (subfossil); Santa Maria, the type material (1.8 × 1.1 to 2.3 × 1.3 mm); Lucira (Santa Marta), 12 sh. (1.5 × 0.9 to 1.7 × 1.0 mm); Lucira (Cesar), 1 sh.; São Nicolau, 15 sh (1.8 × 1.0 to 1.9 × 1.1 mm); Ponta Albina/Baía dos Tigres, 40 m, 12 sh.

Description: Shell conical, translucent, adults 1.5 × 0.9 to 2.3 × 1.3 mm (holotype 1.8 × 1.0 mm). Protoconch dome-shaped (300 μ in diameter) of 1½ to 1¾ whorls, with ill-defined, flat spirals and covered with spiral rows of rather coarse, pits. Teleoconch with ¾ to 4 whorls. Spire whorls flat, body whorl faintly angulated along a line continuing the suture, non-umbilicate. Outer lip orthocline, with very thin edge, thickened in the adult at some distance from its edge. Color of shell very pale buff to pinkish on apical whorls; two last whorls with a series of very faint subsutural flames, a colorless zone around the periphery of the body whorl; another series of faint flames on periumbilical area, matching the subsutural ones or merged into a continuous darker periumbilical band. Operculum dark crimson, along the ridge and edges, pale yellowish on distal surface; external surface shagreened with hardly distinct growth lines. Patterns of animal not observed in life, seen on rehydrated specimens to have black markings on opercular lobes and on the snout.

Habitat: On bottoms of calcareous red algae ("maerl") in a few meters depth and clear water.

Distribution: Known only from Angola; live-taken only in the province of Benguela, Southern Angola.

Remarks: This species shares with *B. cinguloides* the sculpture of very coarse pits in the protoconch. Shells found on the continental shelf of Northern Angola are similar, but larger. They are presumably derived from Pleistocene deposits which occur in 50–120 m; the material in such samples contains many littoral species, including some now restricted to the south.

Genus *Pseudodiala* Ponder, 1967

Type species: *Diala acuta* Carpenter, 1864, by original designation.

Shell with smooth, rather thin teleoconch, very narrowly umbilicate, generally whitish; spire whorls rather flat, body whorl with a faint peripheral keel. Aperture ovate,

with a thin, opisthocline outer lip. Operculum as in *Barleeia*.

Radula (Ponder, 1983 and herein, Fig. 73–74): central tooth with a large median cusp with blunt tip, and 2–3 small lateral denticles; one sharp basal denticle on each side, separated by a broad U-shaped projection. Lateral and marginal teeth as in *Barleeia*.

Ponder (1983) synonymized *Pseudodiala* with *Barleeia*, but *P. niso* n. sp. shares with the type species of *Pseudodiala*, *P. acuta*, the opisthocline aperture (see Fig. 19) and the narrow central cusp of the radula. The West African species assigned to *Pseudodiala* also stand apart from *Barleeia* by their habitat on soft bottoms of the shelf rather than in intertidal or shallow subtidal hard bottom biota. These are retained as a separate group on these grounds.

Pseudodiala niso Gofas, new species
(Figures 19, 53–54, 73–74)

Type material: Holotype collected alive (MNHN) and 55 paratypes (15 AMS cat. C.305094, 20 MNCN cat. 15.05/20536, 20 MNHN), empty shells from the type locality.

Type locality: Senegal, off Gorée, 50 m (14°32'N, 17°25.5'W).

Material examined: (all MNHN except paratypes specified above) **Senegal:** off Gorée, 50 m, the holotype and 55 paratypes (sh.), Marche-Marchad leg.; Cap de Naze, 25 m, from fish stomach, 3 specs. (3.2 × 1.8 to 3.5 × 2.0 mm), Marche-Marchad leg.; Off Saloum, 50 m, 28 sh., Marche-Marchad leg.; "Petite côte" (i.e. coast between Dakar and the Saloum estuary), 32 m, 1 spec., Leung-Tack leg.

Description: Shell conical, translucent, adults 2.7 × 1.5 to 3.5 × 2.0 mm (holotype 2.7 × 1.7 mm). Protoconch stub-shaped with rounded top (400 μ in diameter) of 1½ to 1¾ whorls, with imperforate surface, ill-defined, flat spirals and a very definite suprasutural keel. Teleoconch with ¾ to 4½ whorls. Spire whorls hardly convex, body whorl carinate along a line continuing the suture, distinctly umbilicate. Outer lip strongly opisthocline, beveled to a quite thin edge, parietal callus separating from the body whorl in adults. Color of shell uniformly whitish to grayish. Operculum dark crimson, with a faint external ridge along the columellar side. Animal not observed.

Habitat: On the continental shelf, 30–100 m.

Distribution: Known only from Senegal.

Remarks: The imperforate protoconch of this species is atypical in the Barleeidae, but this character state is bridged to the more usual pitted protoconch by the tiny punctures of the next species *P. acquinotialis* n. sp. The faint suprasutural keel in the protoconch of *P. niso* is homologous to the stronger suprasutural spiral ridge in *P. acquinotialis*, and the overall similarity in protoconchs indicates a close relationship between these spe-

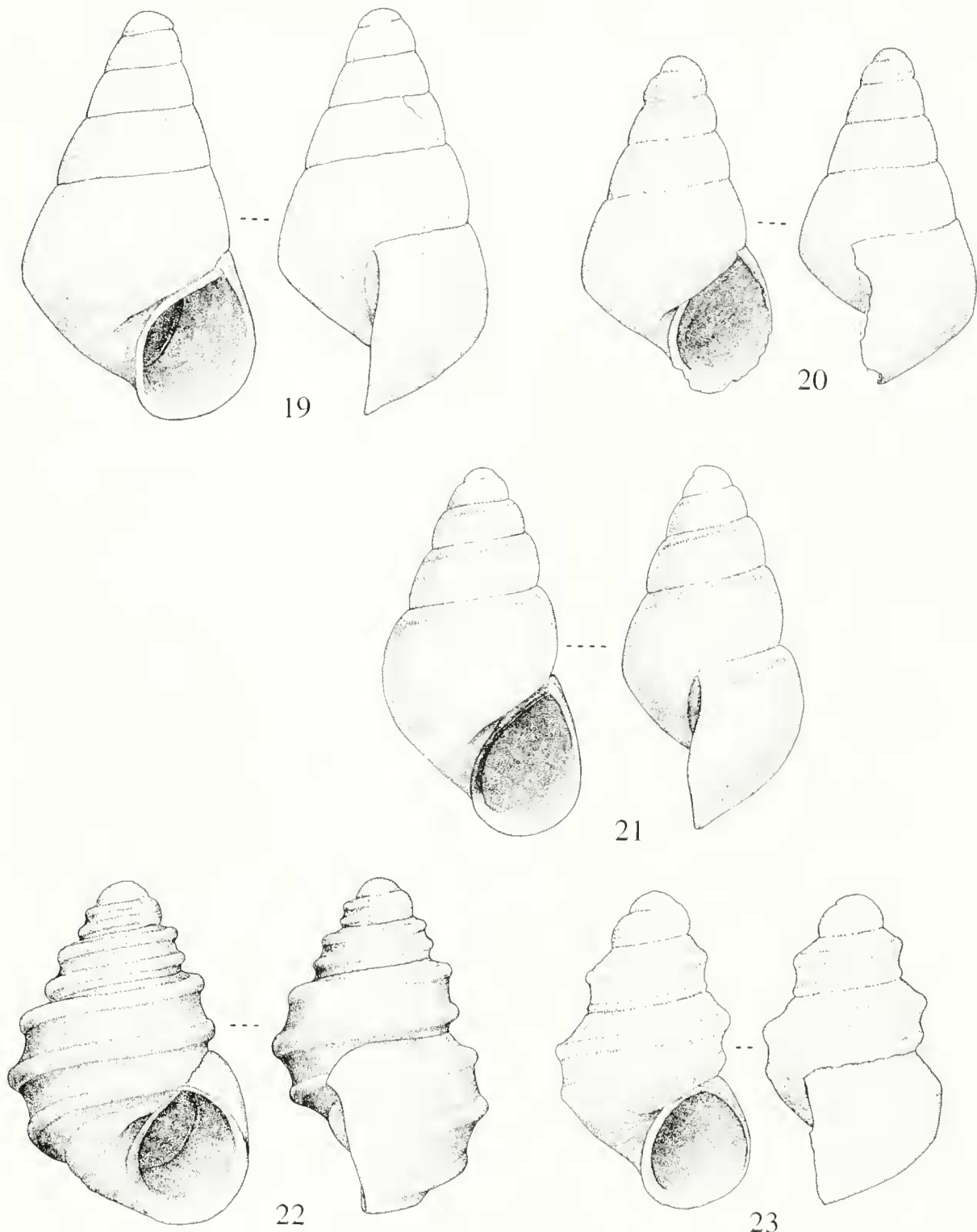


Figure 19. *Pseudodiala niso* Gofas, new species, holotype from off Gorée (50 m), Senegal, length 2.7 mm. **Figure 20.** *Pseudodiala aequinoctialis* Gofas, new species, holotype from off Equatorial Guinea (150 m), length 1.6 mm. **Figure 21.** *Pseudodiala corollaria* Gofas, new species, holotype from Santa Ana, São Tomé, length 1.7 mm. **Figure 22.** *Tropidorissoia taphrodes* Tomlin & Shackelford, 1915, specimen from Praia das Conchas, São Tomé, length 1.7 mm. **Figure 23.** *Tropidorissoia secunda* Rolán & Templado, 1994, paratype (MNHN) from Praia Emilia, São Tomé, length 1.1 mm.

cies. The name is allusive to the resemblance with the eulimid genus *Niso*.

Pseudodiala acquinotialis Gofas, new species
(Figures 20, 55–56)

Type material: The holotype (MNHN).

Type locality: Equatorial Guinea (01°40'N, 09°25'W), 150 m.

Material examined: Equatorial Guinea: the holotype. **Principe:** Santo Antonio, 6–10 m, 21 sh., Rolán leg. (CER); Baia das Agulhas, 8 m, 21 sh., Rolán leg. (CER).

Description: Shell conical, translucent, adults 1.6 × 1.0 to 2.4 × 1.3 mm (holotype 1.6 × 0.9 mm). Protoconch globular with rounded top (300 μ in diameter) of 1½ whorl, with broad spiral ridges, the lowermost of which forms a suprasutural keel, and tiny punctures evenly distributed without lineations. Teleoconch with 3½ whorls, externally smooth, sometimes with irregular internal punctures seen by transparency. Early spire whorls somewhat convex, body whorl carinate along a line continuing the suture, distinctly umbilicate. Outer lip strongly opisthocline, thin. Color of shell uniformly whitish to grayish. Animal and operculum not observed.

Habitat: Unknown, holotype collected as an empty shell on the continental shelf (150 m depth), from a geotechnical core for petroleum exploration, additional material dredged in 6–10 m on soft bottoms around the island of Principe.

Distribution: Known from Equatorial Guinea and the island of Principe.

Remarks: This species is allied to *P. niso*, with which it shares the general shape, opisthocline lip (broken on all specimens but inferred from the growth lines), the keeled and umbilicate body whorl. It is readily distinguished from *P. niso* by its protoconch with distinct spirals and tiny perforations. It is distinguished from the next species *P. corollaria* n. sp. by lacking the brown color on the parietal side of the aperture, by its larger size, higher spire, flatter whorls and by the profile of its last whorl, which is slightly angulose (more conspicuously in immature specimens).

The holotype, collected in a box core, is slightly immature and possibly derived from a Pleistocene deposit, but is the best preserved specimen. On some specimens from Principe, some tiny and evenly distributed punctures can be seen by transparency inside the spire whorls. This feature may be restricted to some specimens and could not be seen on the holotype.

Pseudodiala corollaria Gofas, new species
(Figures 21, 57–58)

Type material: Holotype (MNCN cat. 15.05/20536) and 7 paratypes collected alive from the type locality. 3 paratypes (MNHN) collected alive from Praia Mutamba.

Type locality: Santa Ana, São Tomé (00°15.5'N, 06°45'W), 2 m.

Material examined: (all collected by E. Rolán) **São Tomé:** Santa Ana, 2 m, 8 specs., (holotype and paratypes MNCN) and 3 sh. (CER); Praia Mutamba, 4 m, 3 specs., (paratypes MNHN); Lagoa Azul, 4 m, 5 sh. (CER); Praia das Conchas, 5 m, 6 sh. (CER).

Description: Shell conical, translucent, adults 1.4 × 0.8 to 1.8 × 1.0 mm (holotype 1.7 × 1.0 mm). Protoconch globular with rounded top (300 μ in diameter) of 1½ whorl, with broad spiral ridges, and tiny irregular pits, very loosely arranged along spiral rows. Teleoconch with 3 to 3½ whorls, externally smooth, sometimes with irregular internal punctures seen by transparency. Spire whorls quite convex, body whorl rounded, distinctly umbilicate. Outer lip strongly opisthocline, thin. Color of shell whitish to grayish, translucent, with the parietal edge of the aperture strongly tinged with brown. Protoconch generally more opaque, tinged with yellowish or reddish. Operculum dark crimson. Animal not observed; remains of a black mantle seen attached to the interior of the shell.

Habitat: On soft bottoms of muddy sand in shallow subtidal sites.

Distribution: Known from the Island of São Tomé.

Remarks: This species differs from the closely related *P. acquinotialis* by not being carinate at any stage, by its smaller size and more convex whorls, by the more distinctly pitted protoconch, and by the dark columellar edge of the aperture.

Genus *Tropidorissoia* Tomlin and Shackleford, 1915

Type species: *Tropidorissoia taphrodes* Tomlin and Shackleford, 1915, by monotypy.

Shell with stout, solid teleoconch and strong spiral keels, very narrowly umbilicate, generally tinged with brown. Aperture ovate, slightly prosocline to orthocline, with smooth inner lip, thickened at some distance inside and then beveled to a thin edge. Protoconch with spiral series of pits, with or without superimposed spiral cords. Head-foot pigmented with black and/or yellow. Operculum as in *Barleeia* except for pale brown color. Radula (Fig. 75–76) as in *Barleeia*.

All the species from St. Helena (*Rissoa aqua*, *R. perfecta*, *R. platia*, *R. varicifera*, *R. vaga*, *R. walkichi*, *R. simulans*, all of Smith, 1890) classified or tentatively classified in *Tropidorissoia* by Tomlin and Shackleford (1915) were referred or tentatively referred by Ponder (1985) to his new rissoid subgenus *Lirocingula*, on the basis of conchological similarity with the South African type species *L. winslowae* (Bartsch, 1928). Data on the soft parts, radulae and opercula are at present wanting for a definitive placement.

Tropidorissoia taphrodes Tomlin and Shackleford, 1915 (Figures 22, 59–60, 75–76)

Tropidorissoia taphrodes Tomlin and Shackleford, 1915 pl.5, fig. 5

Type material: Holotype (live collected) in British Museum (Natural History); 15 paratypes in National Museum of Wales, Cardiff, cat. 1955.158.1121.

Type locality: Island of São Tomé.

Material examined: São Tomé: Esprainha, 19* + 30 specs., Gofas and Fernandes leg. 11.1985; Praia Mutamba, 9 specs., Fernandes leg. 12.1986; Praia Mutamba, 6 sh., Rolán leg. (CER); Lagoa Azul, 5 m, 5 sh., Rolán leg. (CER); Praia das Conchas (Guadalupe), 19* + 40 specs., Gofas & Fernandes leg. 11.1985; Praia das Conchas, 11 sh., Rolán leg. (CER); Baía de Ana Chaves, 4 sh., Rolán leg. (CER); Santa Ana, 3 specs. Rolán leg. (CER). **Príncipe:** Santo Antonio, 6–10 m, 41 specs. Rolán leg. (CER); Baía das Agulhas, 8 m, 19 specs., Rolán leg. (CER).

Description: Shell conical, solid, adults 0.8 × 0.5 to 1.2 × 0.7 mm. Protoconch dome-shaped (350 μ in diameter) of 1½ whorl, with strong spiral cords and superimposed minute spiral rows of pits. Teleoconch of 2 to 2½ whorls, with two strong, rounded keels on the spire whorls and with a third similar keel on the body whorl; a spiral thickening around the small umbilical chink. Outer lip slightly prosocline, thickened deep inside, then beveled to a thin edge. Parietal callus moderately developed, detached from the umbilical chink. Color of shell reddish brown, sometimes pale yellowish. Operculum yellow, translucent, with an internal peg. Head-foot with superficial gray pattern on the snout and opercular lobes. Opaque yellowish white flecks axially on tentacles, triangular opaque yellowish-white granular masses behind each eye. Reddish buccal mass clearly seen by transparency. Foot white, with tiny opaque white flecks on the sole; metapodium not conspicuously cleft as in *Barleeia*.

Habitat: Intertidal to shallow subtidal on rocky shores with clear water; in algal mat, mainly of coralline algae.

Distribution: Known only from the islands of São Tomé and Príncipe.

Remarks: Fernandes and Rolán (1993) noted a difference in the populations from Príncipe, these having frequently a pale shell whereas all specimens from São Tomé are uniformly reddish-brown. In the material examined, 36 out of 41 specimens from Santo Antonio and all 19 specimens from Baía das Agulhas are pale.

The protoconch has a peculiar sculpture, quite different from that of most *Barleeia*, but similar to that of "*Barleeia*" *congenita* Smith, 1890 from St. Helena Island (Fig. 63–64).

Tropidorissoia secunda Rolán and Templado, 1994 (Figures 23, 61–62)

Tropidorissoia secunda Rolán and Templado, 1994 237–242, fig. 1–4

Type material: Holotype (MNCN cat. 15.05/6975); Paratypes (3 MNHN, 3 British Museum (Natural History), 3 American Museum of Natural History, 10 CER, 10 private collection of F. Fernandes, Luanda).

Type locality: Praia Emilia, São Tomé (00°21.7'N–06°43.5'E).

Material examined: (collected by E. Rolán) São Tomé: The MNHN paratypes; Praia das Conchas, 6 sh. (CER); Lagoa Azul, 4 m, 25 sh., (CER); Baía de Ana Chaves, 1 sh. (CER). **Príncipe:** Santo Antonio, 6–10 m: 17 sh. (CER); Baía das Agulhas, 8 m, 25 sh. (CER).

Description: Shell conical, solid, adults 0.8 × 0.5 to 1.2 × 0.7 mm. Protoconch dome-shaped (220 μ in diameter) of 1½ whorl, with minute spiral rows of pits. Teleoconch of 2 to 2½ whorls, with a strong median keel on the spire whorls and with a suprasutural cord which extends on the body whorl to form another keel. Outer lip slightly prosocline, beveled inside to a thin edge. Parietal callus moderately developed, detached to form an umbilical chink. Color of shell white to pinkish. Operculum yellow, translucent. Head-foot with superficial plain black pattern on the snout and opercular lobes. Opaque white axial bar on tentacles, large, triangular opaque white granular masses behind each eye. Pink buccal mass visible by transparency.

Habitat: Subtidal in a few meters depth.

Distribution: Only known from the islands of São Tomé and Príncipe.

Genus *Lirobarleeia* Ponder, 1985

Type species: *Alvania nigrescens* Bartsch & Rehder, 1939 (*Alvania galapagensis* Bartsch, 1911 sensu Ponder, 1983), pending decision of ICZN (see Hertz, 1994 for a discussion of the type species).

Shell with elongate, solid teleoconch and spiral sculpture in all species considered, non-umbilicate or very narrowly umbilicate, generally tinged with brown. Protoconch with minute pits loosely arranged in a spiral direction in the species considered herein; with strong spiral ridges and no pits in the type species. Outer lip opisthocline like in most *Rissoina* species. Head-foot pigmented with black and/or yellow. Operculum as in *Barleeia*.

Radula (Ponder, 1983 and herein, Fig. 77–78): central tooth with a large rectangular median cusp, one large triangular denticle on each side of it, and sometimes one or two very small denticles flanking these on the sides of the tooth; one sharp basal denticle on each side, separated by a broad, prominent lamella. Lateral teeth (one pair) with a rather broad base, terminating with a large, rather trapezoidal cusp flanked by slightly smaller cusps to either side; with a U-shaped projection beneath those. Mar-

ginal teeth (two pairs) narrow, hook-shaped, with uniplicate small cusps towards the distal end.

I have included the three species described here in *Lirobarlecia* despite important differences in both protoconch and teleoconch sculpture. They are congeneric with *L. albolirata* (Carpenter, 1864) and *L. kelseyi* (Dall & Bartsch, 1902), two West American species that Ponder (1983) included in *Lirobarlecia* notwithstanding the same differences. The radula of the two species described here in agrees fairly well with those illustrated by Ponder (1983), although lateral outermost denticles are wanting in the central tooth of *L. sublaevis* n. sp. The specimen figured by Ponder (1983) to illustrate the designated type species *Alvania galapagensis* Bartsch, 1911 has been shown by Hertz (1994) to belong to *Alvania nigrescens* Bartsch & Rehder, 1939, and this case of misidentification should be settled by a decision of ICZN. The actual *A. galapagensis* is a rare species from deeper water and may be a pickworthiid.

The type species of *Fictonoba* Ponder, 1983 also resembles the species dealt with here, but differs in having a very different central tooth on the radula.

Lirobarlecia elata Gofas, new species
(Figures 24, 65–66)

Type material: Holotype (MNHN) and 200 paratypes (50 AMS cat. C.305095, 50 MNCN cat. 15.05/20538, 50 MNHN, 50 UAN) collected alive from the type locality.

Type locality: Baía de Santa Maria, province of Benguela, Angola (13°35'S, 12°33'E), on calcareous algal bottom in 8–10 m.

Material examined: (collected by the author; all MNHN except paratypes specified above) **Angola:** Caotinha, 1 sh.; Baía de Santa Maria, the type material; Baía da Lucira (Cesar) on calcareous algal bottom 10 m, 1 spec. and 12 sh.; Santa Marta, dredged 40 m on shell sand, 25 sh.; Chapeu Armado, 1 sh.; Praia Amelia, 40–60 m, 3 sh.

Description: Shell elongate, solid, adults 3.2 × 1.6 to 6.2 × 2.6 mm (holotype 5.1 × 2.3 mm). Protoconch dome-shaped (500 μ in diameter) with 1 to 1¼ whorl, apparently smooth at low magnification, with very minute, irregular pits, arranged in spiral bands so as to suggest a faint spiral sculpture. Teleoconch with 5¼ to 6 whorls, with spiral sculpture of very unequal, sharp cords (15–20 on penultimate whorl). Early spire whorls rather flat, the later ones moderately convex, body whorl rounded, hardly umbilicate, with its latest part wider and salient from the profile. Outer lip opisthocline in adults, thickened at some distance in the last ¼ whorl and beveled inside to the edge; parietal callus moderately developed, detached anteriorly in adults. Color of shell pale brown to whitish, with very faint, delicate axial flames starting from the suture; paler towards the termination of the body whorl; inside of aperture whitish to brown, often with two brown streaks on the lip. Operculum dark crimson. Patterns of animal not observed in life, seen on

rehydrated specimens to have black markings on opercular lobes and on the snout.

Habitat: On bottoms of calcareous red algae ("maerl") or coarse, clean shell gravel in a few meters depth in sheltered bays with transparent waters.

Distribution: Only known from Angola.

Remarks: There is some similarity with *Rissoa glypta* Smith, 1890 from St. Helena, which is smaller, has weak axial folds and somewhat carinate whorls. *Lirobarlecia elata* is the largest of the Angolan *Lirobarlecia*; it is distinguished from both *L. pupoides* n. sp. and *L. sublaevis* n. sp. by its more acute apical spire angle, and coarser sculpture; from *L. sublaevis* also by the black markings on the animal and by the protruding lip of the aperture in the adults.

Lirobarlecia sublaevis Gofas, new species
(Figures 25–26, 67–68, 77–78)

Type material: Holotype (MNHN) and 480 paratypes (120 of which 20 juv. in each of the following: AMS cat. C.305091, MNCN cat. 15.05/20540, MNHN, UAN) from the type locality, live collected.

Type locality: Praia das Conchas, province of Namibe, Angola (15°07.0'S, 12°06.7'E), in large tidal pools.

Material examined: (collected by the author; all MNHN except paratypes specified above) **Angola:** Caotinha, 8 specs.; Limagens, 4 sh.; Baía de Santa Maria, 8–10 m, 500 sh.; Lucira (Cesar) 8–10 m, 150 sh. (2.6 × 1.4 to 4.3 × 2.2 mm); Lucira (Bissonga) intertidal 12* + 18 specs.; Santa Marta, 3 sh.; São Nicolau 14* specs. + 30 sh., 2.1983. Chapeu Armado, 100 specs. (many juv.); Praia das Conchas, the type material and 8* specs. (2.8 × 1.4 to 4.6 × 2.3 mm); Praia Amelia, 52 specs. (2.5 × 1.4 to 3.6 × 1.6 mm).

Description: Shell elongate, very solid, adults 2.5 × 1.4 to 4.6 × 2.3 mm (holotype 3.0 × 1.5 mm). Protoconch dome-shaped (400 μ in diameter) of 1¼ whorls, apparently smooth at low magnification, with extremely minute, irregular pits, loosely arranged along a spiral direction. Teleoconch of 3½ to 4½ whorls, with faint, flat spiral threads, the intervals of which show spiral series of punctures (only visible under SEM). Whorls moderately convex, body whorl rounded, slightly constricted, hardly umbilicate. Outer lip orthocline, thickened at some distance in the last ¼ whorl and beveled inside to the edge; parietal callus rather thin, detached anteriorly. Color of shell whitish or pale orange brown with subsutural area paler; occasionally with two blurred spiral orange brown bands on a whitish background. Operculum dark crimson. Head-foot with yellow axial bars on tentacles, yellow granular masses behind each eye, on the tip of the snout, on each side of the anterior part of the propodium. Pink buccal mass clearly visible by transparency.

Habitat: Intertidal, in pools or flats with rocks embedded in clean, coarse sand and algal overgrowth.

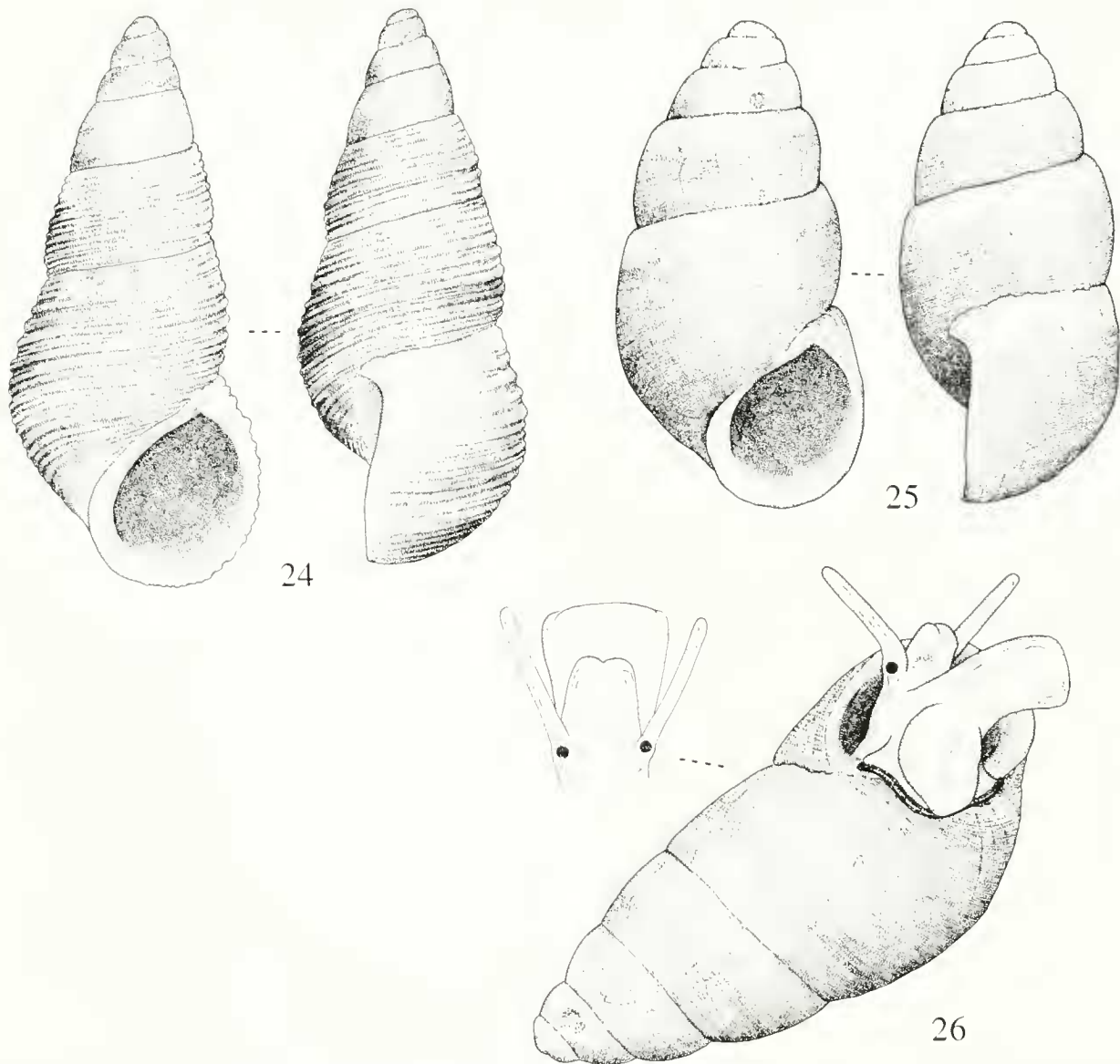


Figure 24. *Liobarleecia clata* Gofas, new species, holotype from Santa Maria (Angola), length 3.1 mm **Figures 25–26.** *Liobarleecia sublaevis* Gofas, new species. **25.** Holotype from Praia das Conchas (Angola), length 3.0 mm. **26.** Living specimen from Caotinha (Angola), length 3.1 mm.

Distribution: Only known from Angola.

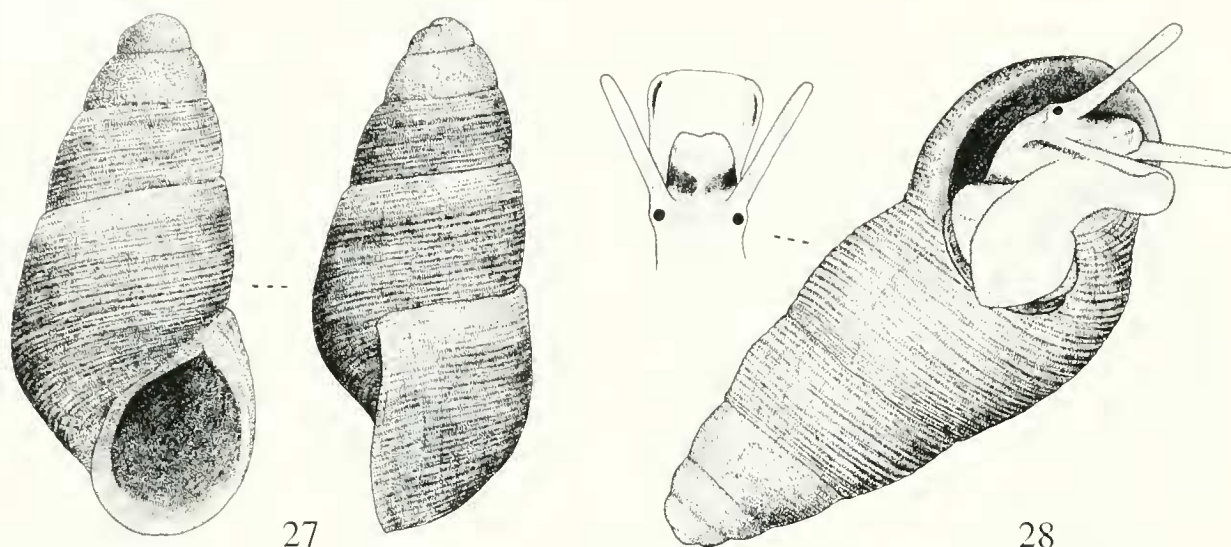
Remarks: *Liobarleecia sublaevis* may resemble some very smooth specimens in the population from Corimba, referred to *L. pupoides* n. sp., but may be distinguished by its lack of black patterns on the head-foot, the absence of any pigmentation on its opercular lobes, and the regularly fusiform profile of its shell, which lacks the protruding body whorl.

Liobarleecia pupoides Gofas, new species
(Figures 27–28, 69–70)

Type material: Holotype (MNHN) and 200 paratypes (50 AMS cat. C.305096, 50 MNCN cat. 15.05/20539, 50 MNHN, 50 UAN) collected alive from the type locality.

Type locality: Corimba, province of Luanda, Angola (8°50'S, 13°09'E), on shell gravel bar in 20 m depth.

Material examined: (collected by the author; all MNHN except paratypes specified above) **Angola:** Corimba, the type material (2.2 × 1.1 to 3.8 × 1.5 mm); Corimba, Praia Etambar in shell sand: 34 shells (2.5 × 1.1 to 3.4 × 1.5). (*Liobarleecia* cf. *pupoides*) Baia dos Tigres, 8* + 31 specs., 8.1985. (2.4 × 1.1 to 2.8 × 1.2 mm).



Figures 27–28. *Lirobarleeia pupoides* Gofas, new species. 27. Holotype from Corimba (Angola), length 2.6 mm. 28. Living specimen from Corimba (Angola), length 3.0 mm.

Description: Shell pupoid, elongate, moderately solid, adults 2.2×1.1 to 3.8×1.5 mm (holotype 2.6×1.2 mm). Protoconch dome-shaped (400μ in diameter) of $1\frac{1}{4}$ whorl, apparently smooth at low magnification, with extremely minute, crowded, irregular pits, loosely arranged along a spiral direction. Teleoconch of $3\frac{1}{2}$ to $4\frac{1}{2}$ whorls, with flat spiral threads, the intervals of which show spiral series of punctures (only visible under SEM), and with very faint axial wrinkles. Whorls flat to moderately convex; body whorl rounded, hardly umbilicate. Outer lip orthocline, beveled inside to the edge which is quite rounded in adults; parietal callus moderately developed, somewhat detached anteriorly and posteriorly. Color of shell orange brown to pale yellowish, occasionally with two blurred spiral bands inside the aperture. Operculum dark crimson. Head-foot with superficial black blotches on each side of the snout, occasionally confluent and extending over the head; black on opercular lobes and anteriorly on the sides of the propodium; yellow axial bar on tentacles, yellow granular masses behind each eye, on the tip of the snout, on the anterior part of the propodium, and on the opercular lobes anteriorly to the black markings.

Habitat: In coarse shell sand, shallow subtidal.

Distribution: Only known from Angola.

Remarks: Very smooth specimens from Corimba may resemble the previous species, *L. sublaevis* in having a similar protoconch and teleoconch microsculpture. *Lirobarleeia sublaevis* generally has a thicker and larger shell, a more fusiform profile without a protruding lip and lacks any black pattern on the head-foot and the opercular lobes. Old shells, possibly subfossil, collected on the beach at Corimba, are larger (up to 4.3×1.8 mm) and have a coarser spiral sculpture on the teleoconch, approaching that of *L. elata* n. sp. They never-

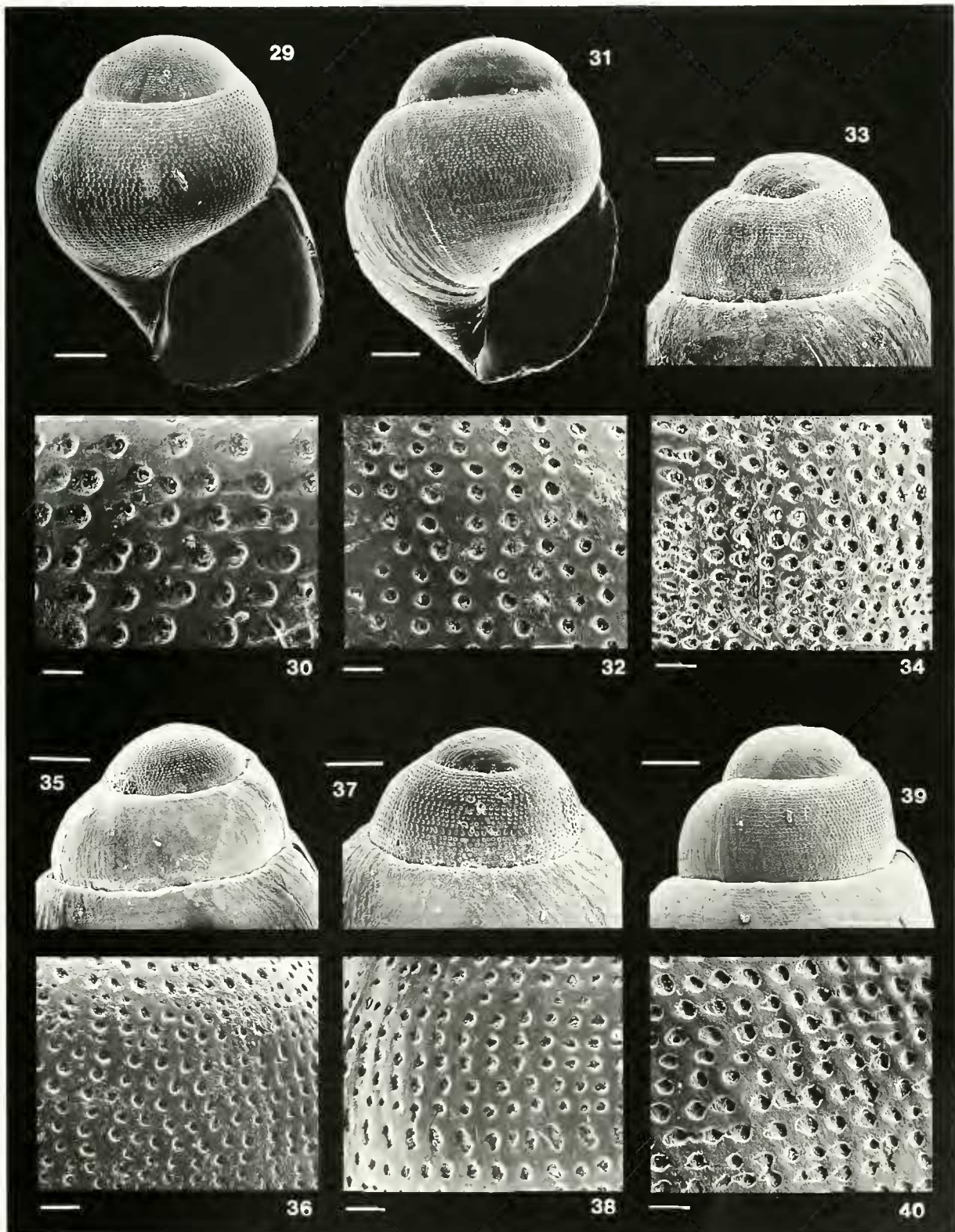
theless retain the pupoid outline that is typical of this species. In the extreme South of Angola, in Baía dos Tigres, there is a local population of *Lirobarleeia* resembling that of Corimba both in shell morphology and color pattern of the head-foot, and also living in ca. 10 m depth on a coarse shell sand. It is not clear, from the material available, if it is the same species with a disjunct range, occurring where adequate substrate exists, or if it is a sister species derived independently from an ancestral stock.

DISCUSSION

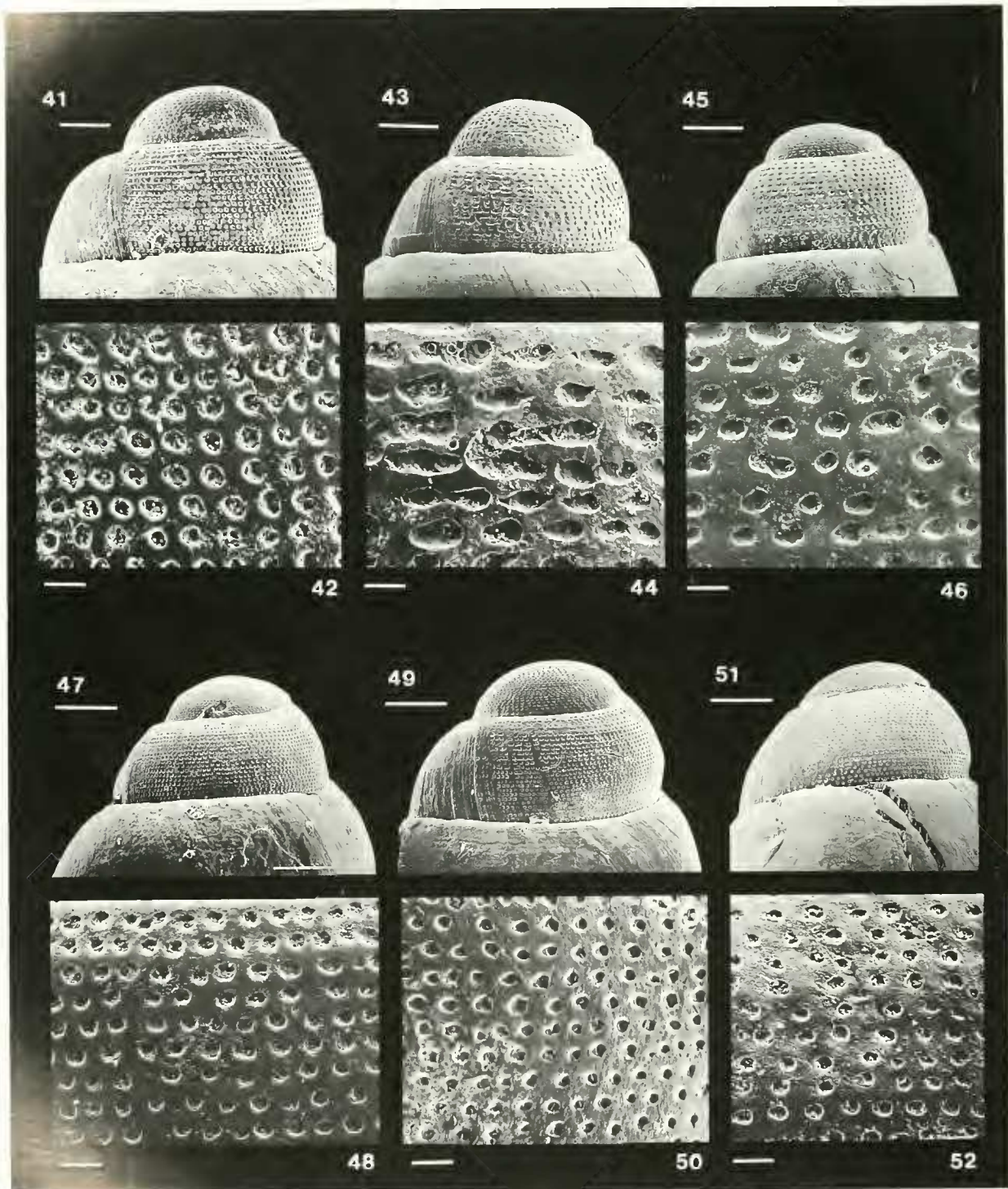
At the local level, sympatric species of Barleeidae may show differentiation in size, or in habitat. The NW African species *Barleeia unifasciata* and *B. gougeti* may be microsympatric and have distinct, although overlapping size ranges. The three Cape Verde Islands species described herein (*B. verdensis* n. sp., *B. acmilii* n. sp., *B. chefae* n. sp.) and the two *Barleeia* from São Tomé (*B. tomensis* n. sp., *B. taeniolata* n. sp.) also exhibit size differentiation among microsympatric species.

The sympatric occurrence of several species (up to four in Baía de Santa Maria, Angola) is accompanied by a segregation in habitat. Among the Angolan species, *Barleeia pervulgata* n. sp. (the typical form) is found intertidally in algal tufts, *B. cinguloides* n. sp. intertidally among stones lying on coarse sand, while *B. picta* n. sp. occurs subtidally among algal concretions together with *Barleeia* cf. *pervulgata* and *Lirobarleeia elata* n. sp. The two Southern species of *Lirobarleeia* are also segregated, *L. sublaevis* n. sp. occurring together with *B. cinguloides* or in tidal pools, while *L. elata* is always subtidal. There is a preference for soft bottoms among *Lirobarleeia* and *Pseudodiala*, and for hard bottoms among *Barleeia*.

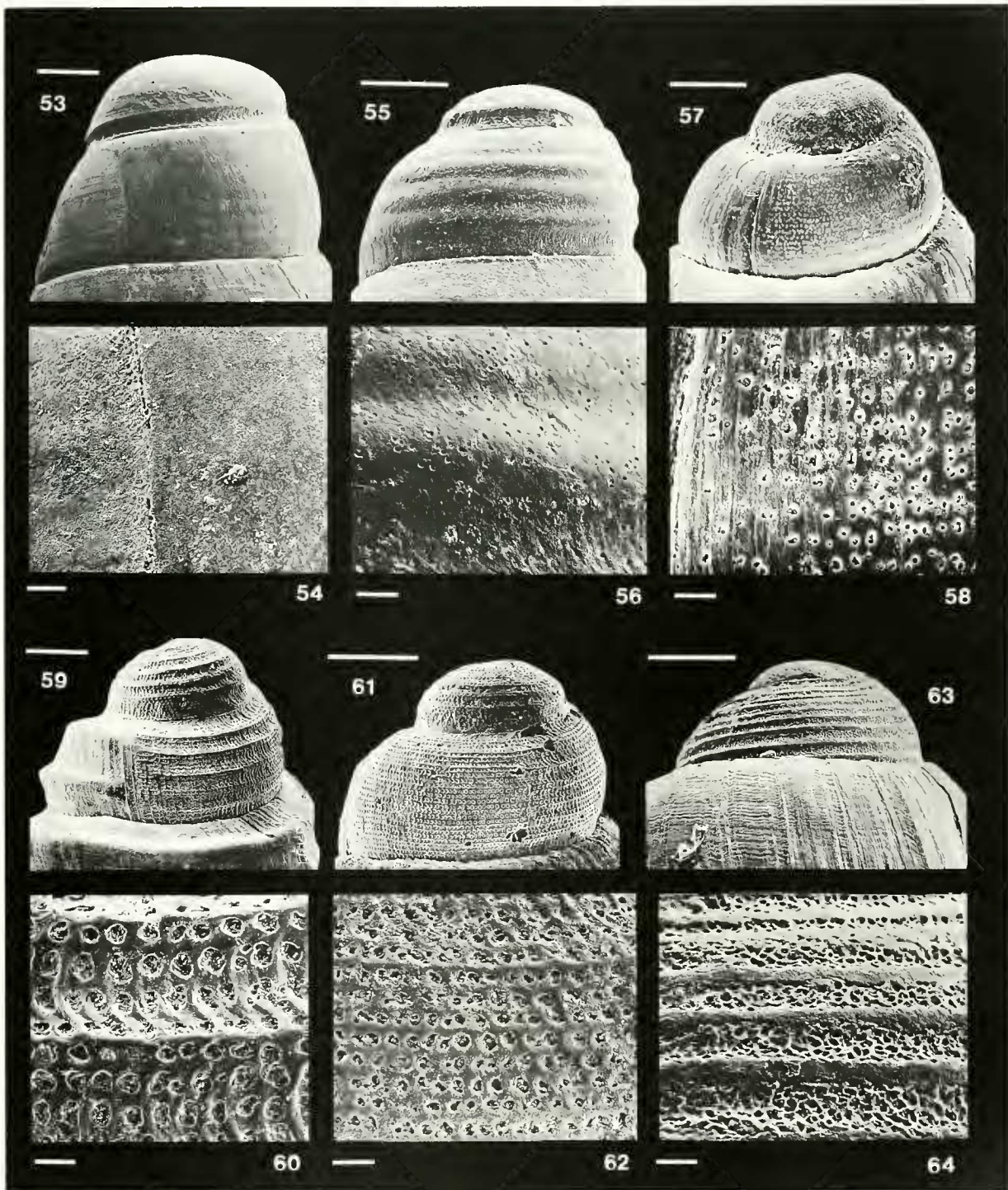
Thus far, the coast of Western America was known as



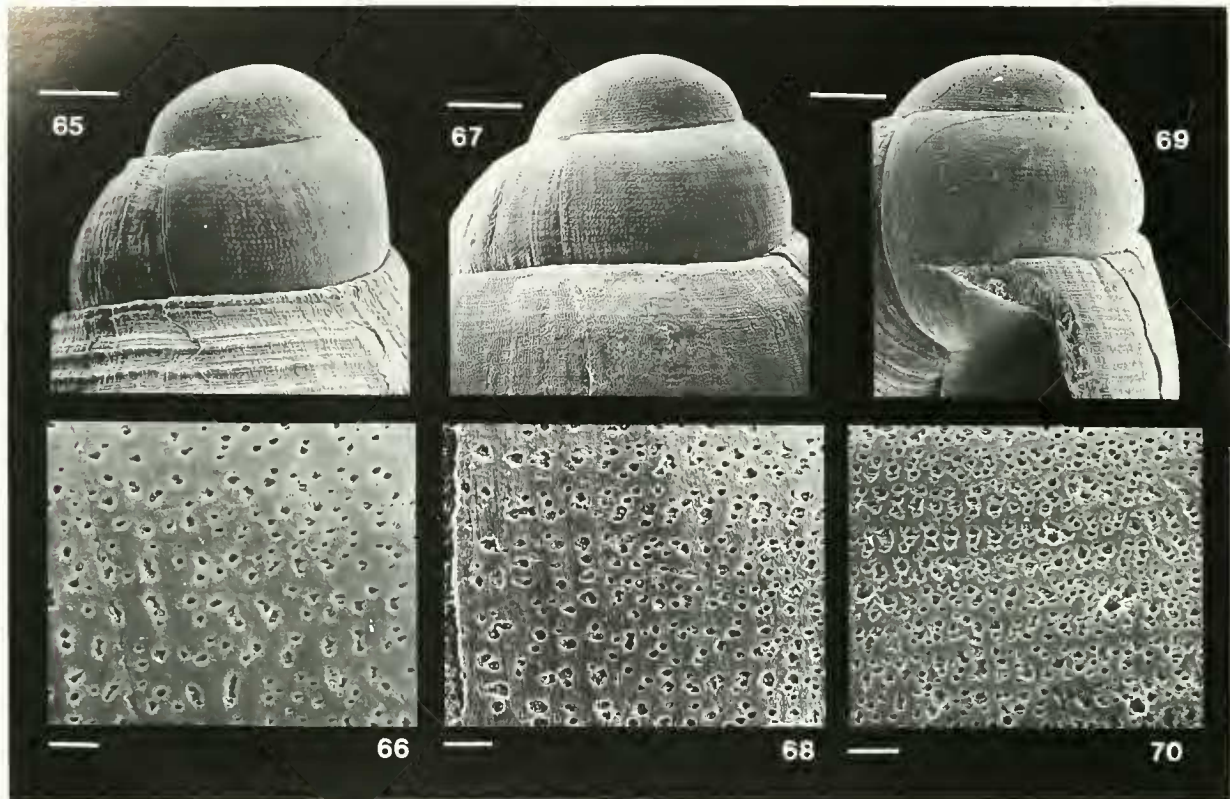
Figures 29–40. Protoconchs of *Barleecia*. general views (scale bars 100 μ) and enlarged portions of the surface (scale bars 10 μ), the latter all to scale. 29–30. *Barleecia unifasciata* (Montagu, 1803), Ploumanac'h (France). 31–32. *Barleecia gougeti* (Michaud, 1830), Essaouira (Morocco). 33–34. *Barleecia verdensis* Gofas, new species, paratype, Salmanza (São Vicente, Cape Verde Is.). 35–36. *Barleecia aemilii* Gofas, new species, Salmanza (São Vicente, Cape Verde Is.). 37–38. *Barleecia cheffae* Gofas, new species, paratype, Sal-Rei (Boavista, Cape Verde Is.). 39–40. *Barleecia tomensis* Gofas, new species, paratype, Praia das Conchas (São Tomé).



Figures 41-52. Protoconchs of *Barleeia*: general views (scale bars 100 μ) and enlarged portions of the surface (scale bars 10 μ), the latter all to scale. 41-42. *Barleeia taeniolata* Gofas, new species, paratype, Santa Ana (São Tomé). 43-44. *Barleeia cinguloides* Gofas, new species, paratype, Praia Amelia (Angola). 45-46. *Barleeia picta* Gofas, new species, paratype, Santa Maria (Angola). 47-48. *Barleeia pervulgata* Gofas, new species, Caotinha (Angola). 49-50. *Barleeia pervulgata* Gofas, new species, paratype, Chapeu Armado (Angola). 51-52. *Barleeia cf. pervulgata* Gofas, new species, Porto Alexandre (Angola).



Figures 53–64. Protoconchs of *Pseudodiala*, *Tropidorissoia* and “*Barlecia*”, general views (scale bars 100 μ) and enlarged portions of the surface (scale bars 10 μ), the latter all to scale. **53–54.** *Pseudodiala niso* Gofas, new species, off Saloum (Senegal). **55–56.** *Pseudodiala aequinoctialis* Gofas, new species, holotype, Equatorial Guinea. **57–58.** *Pseudodiala corollaria* Gofas, new species, paratype, Santa Ana (São Tomé). **59–60.** *Tropidorissoia taphrodes* Tomlin & Shackleford, 1915, Praia das Conchas (São Tomé). **61–62.** *Tropidorissoia secunda* Rolán & Templado, 1994, Praia das Conchas (São Tomé). **63–64.** “*Barlecia*” *congenita* Smith, 1890, St. Helena.



Figures 65–70. Protoconchs of *Lirobarlecia*: general views (scale bars 100 μ) and enlarged portions of the surface (scale bars 10 μ), the latter all to same scale. 65–66. *Lirobarlecia elata* Gofas, new species, paratype, Santa Maria (Angola). 67–68. *L. sublaevis* Gofas, new species, paratype, Praia das Conchas (Angola). 69–70. *L. pupoides* Gofas, new species, paratype, Corimba (Angola).

the part of the world with the highest species richness in the family Barleeidae. Ponder (1983) recognized 13 species of *Barlecia* (including one *Pseudodiala*) distributed between California and Panama, and 12 species of *Lirobarlecia*, distributed in the same mainland area but also in the Galapagos and Clarion islands.

The description of species from West Africa brings attention to other centers where the family is well represented (Fig. 79). The inner part of the Gulf of Guinea hosts six species representing three genera. The absence of records from Annobón or Fernando Poo islands reflects the lack of data, rather than a real difference between islands.

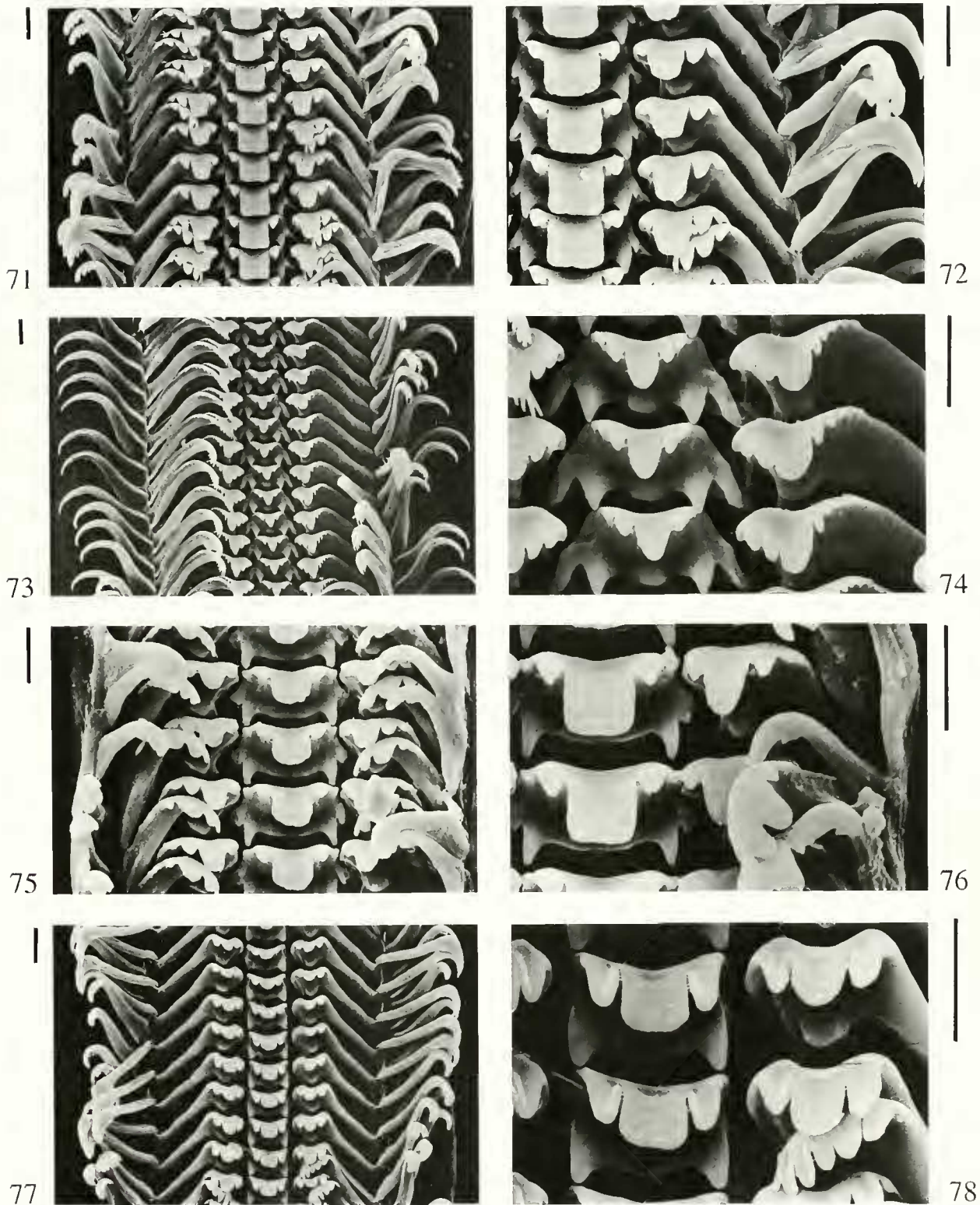
Southern Angola, with six species representing two genera, is another center of richness. The northern limit of five species in Angola coincides with the shift from a rocky coast with clear, cool waters, to a prevalently sandy coastline with warmer, turbid waters north of the city of Benguela. Rocky shores with a well developed cover of small photophilous algae (including *Corallina* spp.) are well represented in the south, unlike the north where hard substrates are scarce and where high turbidity of waters would smother a dense algal cover. The sampling effort has been well balanced between both areas, and the lack of records of *Barlecia* in northern Angola is not a sampling artifact. This supports the view that the gaps

between Angola and the Gulf of Guinea islands, and between the Gulf of Guinea and Senegal, are real. The distribution of *Barlecia* in West Africa may thus reflect the breakdown of a formerly more continuous range.

To the south, the fauna of Namibia remains virtually unknown, but some of the Angolan species, or related ones, may be present there; both *Barlecia* and *Lirobarlecia* are present in the southernmost Angolan sample, less than 100 km from the Namibian border. Despite being a temperate area with rocky shores, South Africa has only two poorly known species, *Barlecia caffra* (Sowerby, 1897) and *B. smithi* Bartsch, 1915, which are definitely outside the West African radiation.

The island of St. Helena may host a number of species of Barleeidae. However, the systematic position of most of the species described by Smith (1890) remains uncertain. *Barlecia congenita* Smith, 1890 lacks spiral sculpture and superficially resembles true *Barlecia*, but its protoconch sculpture (Fig. 63–64) is similar to that of *Tropidorissoia taphrodes*. The species described by Smith as *Rissoa* and tentatively referred by Tomlin and Shaeckleford (1915) to *Tropidorissoia* may be either rissoids or barleecids (see under *Tropidorissoia*).

Considering the Gulf of Guinea and Angola together, there are fewer species (12 species) than in West America but these are more diverse at the generic level: *Tropi-*



Figures 71-78. Radulae, general views of several complete rows (left) and enlarged views of central and lateral teeth (right, all scale bars 10 μ). 71-72. *Barlecia pervulgata* Gofas, new species, Chapeu Armado (Angola). 73-74. *Pseudodiala niso* Gofas, new species, Cap de Naze (Senegal). 75-76. *Tropidorissoia taphrodes* Tomlin & Shackleford, 1915, Praia das Conchas (São Tomé). 77-78. *Lirobarlecia sublaevis* Gofas, new species, Praia das Conchas (Angola).

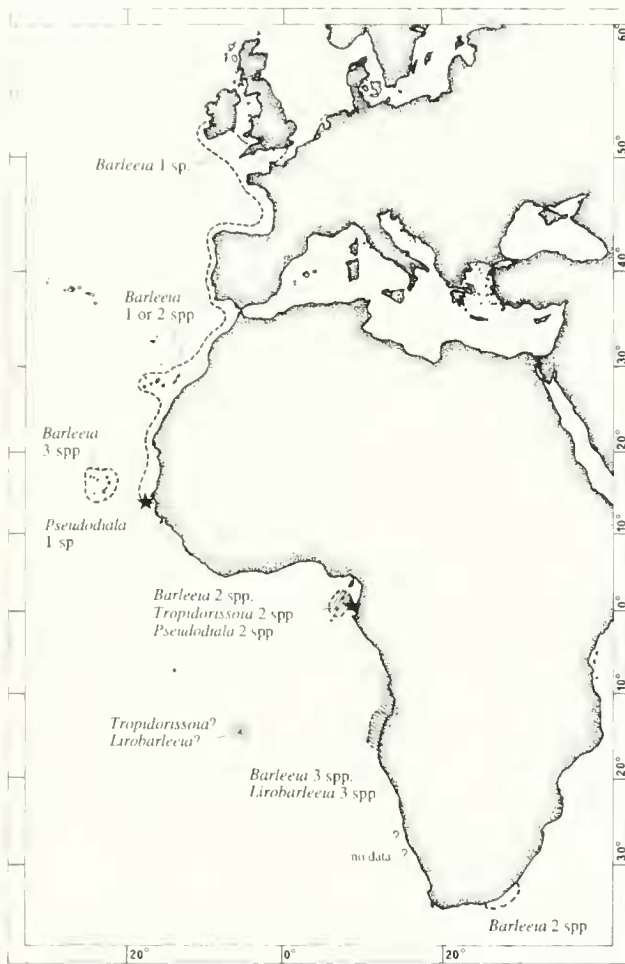


Figure 79. Distribution of the Barlecoidea in the Eastern Atlantic: dashed contour, *Barleecia*; hatched, *Tropidorissoia*, and *Lirobarleecia*; stars, *Pseudodatala*

dorrissoia is present in addition to the three genera found in West America. Thus, West Africa as a whole is the area of the world with the highest number of genera in the family. The representation in Senegal (three species, two genera) and in the Cape Verde Islands (three species, all congeneric) is less spectacular.

Larval development without a planktonic stage has been observed only in *B. unifasciata* and in *B. pervulgata* n. sp., but can be extrapolated to all the other species with similar protoconch characters. Despite this constraint, the insular species are able to disperse between moderately distant islands. The three *Barleecia* species from the Cape Verde were collected on six islands 10 to 100 km apart, and would probably have been found everywhere in the archipelago had all ten islands been sampled. The two species of *Tropidorissoia* and *Barleecia tomensis* described from São Tomé were also found in Príncipe, at a distance of 150 km (Fernandes and Rolán, 1993). Conversely, there seems to be an allopatric distribution for *Pseudodatala aequinoctialis* n. sp., found in the inner part of the Gulf of Guinea, and *P. corollaria*

found in São Tomé. This implies that an efficient alternative to dispersal during pelagic larval development is used by some barleecids. The most likely scheme is that the egg capsules of *Barleecia*, which are very light and attached to algae in shallow subtidal environments, are easily torn off the substrate and float away.

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